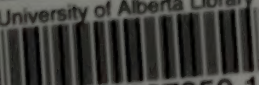


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**2009**  
**AMENDMENTS**  
**to the**  
**Program of Studies: Career and Technology Studies**  
**Junior and Senior High Schools**

**1997–2005 CAREER AND TECHNOLOGY STUDIES STRANDS**

1. **Replace** the Career and Technology Studies title page, following the Career and Technology Studies divider.
2. **Replace** the Career and Technology Studies Program Rationale and Philosophy, page 4 (2005), with revised Program Rationale and Philosophy, page 4 (Revised 2009).
3. **AGRICULTURE**
  - **Replace** Agriculture, pages 9 to 11, 14, 15, 20 and 26 (1997), with **revised** Agriculture, pages 9 to 11, 14, 15, 20 and 26 (Revised 2009).
4. **CONSTRUCTION TECHNOLOGIES**
  - **Remove and discard** Construction Technologies, pages 9 to 36 (1997–2005).
5. **ELECTRO-TECHNOLOGIES**
  - **Remove and discard** Electro-Technologies, pages 9 to 42 (2000–2005).
6. **ENERGY AND MINES**
  - **Replace** Energy and Mines, pages 10, 11, 20 and 27 (1997), with **revised** Energy and Mines, pages 10, 11, 20 and 27 (Revised 2009).
7. **ENTERPRISE AND INNOVATION**
  - **Remove and discard** Enterprise and Innovation, pages 9 to 17 (1997).
8. **FABRICATION STUDIES**
  - **Remove and discard** Fabrication Studies, pages 9 to 37 (2000–2003).
9. **FINANCIAL MANAGEMENT**
  - **Remove and discard** Financial Management, pages 9 to 23 (2000–2003).
10. **FORESTRY**
  - **Replace** Forestry, pages 11 and 22 (1999), with **revised** Forestry, pages 11 and 22 (Revised 2009).
11. **INFORMATION PROCESSING**
  - For the 2009–2010 school year, the following courses will be available separate from the BIT cluster as part of the Information Processing strand. In the 2010–2011 school year, these courses will be included in the new Communication Technology occupational area within the Media, Design & Communication Arts (MDC) cluster:
    - INF1040 Graphic Tools
    - INF2060 Electronic Publishing 1
    - INF2130 Multimedia Authoring 1
    - INF2200 Information Highway 2
    - INF3070 Electronic Publishing 2
    - INF 3130 Multimedia Authoring 2
    - INF 3190 Information Highway 3
    - INF 3200 Internet Services
  - **Remove** Information Processing, pages 9 to 43 (1999–2005), and **replace** with **revised** Information Processing, pages 9–18 (Revised 2009).

*(continued)*



**12. LOGISTICS**

- **Remove and discard** Logistics, pages 9 to 21 (1997).

**13. MANAGEMENT AND MARKETING**

- **Remove and discard** Management and Marketing, pages 9 to 28 (1999–2005).

**14. MECHANICS**

- **Remove and discard** Mechanics, pages 9 to 42 (1997–2005).

**NEW 2009 BUSINESS, ADMINISTRATION, FINANCE & INFORMATION TECHNOLOGY (BIT) AND TRADES, MANUFACTURING & TRANSPORTATION (TMT) CLUSTERS**

1. Insert **new** Career and Technology Studies (Program Philosophy and Rationale, and Program Organization), pages 1 to 13, following the Career and Technology Studies Wildlife strand, page 23 (1997).

**2. BUSINESS, ADMINISTRATION, FINANCE & INFORMATION TECHNOLOGY (BIT)**

- Insert **new** Business, Administration, Finance & Information Technology (BIT), page 1, following the **new** Career and Technology Studies (Program Philosophy and Rationale, and Program Organization), page 13.
- **Computing Science** – Insert the following **new** Computing Science courses, following Business, Administration, Finance & Information Technology (BIT), page 1:
  - Computer Science 1, pages 1–2
  - Structured Programming 1, pages 1–2
  - Structured Programming 2, pages 1–2
  - Client-side Scripting 1, pages 1–2
  - Client-side Scripting 2, pages 1–3
  - Robotics Programming 1, pages 1–3
  - CSE Project A, pages 1–2
  - Computer Science 2, pages 1–4
  - Procedural Programming 1, pages 1–2
  - Data Structures 1, pages 1–2
  - Files & File Structures 1, pages 1–3
  - Second Language Programming 1, pages 1–3
  - Client-side Scripting 3, pages 1–2
  - Robotics Programming 2, pages 1–3
  - CSE Project B, pages 1–2
  - CSE Project C, pages 1–2
  - Computer Science 3, 1–3
  - Computer Science 4, pages 1–2
  - Iterative Algorithm 1, pages 1–2
  - Object-oriented Programming 1, pages 1–2
  - Object-oriented Programming 2, pages 1–2
  - Second Language Programming 2, pages 1–2
  - Server-side Scripting 1, pages 1–3
  - Robotics Programming 3, pages 1–3
  - Recursive Algorithms 1, pages 1–2
  - Dynamic Data Structures 1, pages 1–2
  - Dynamic Data Structures 2, pages 1–2
  - Dynamic Data Structures 3, pages 1–2
  - CSE Project D, pages 1–2
  - CSE Project E, pages 1–2.

*(continued)*

- **Enterprise and Innovation** – Insert the following **new** Enterprise and Innovation courses, following new CSE Project E, page 2:
  - Challenge & Opportunity, pages 1–2
  - Elements of a Venture Plan, pages 1–2
  - ENT Project A, pages 1–2
  - Analyzing Ventures, pages 1–2
  - Financing Ventures, pages 1–2
  - Marketing the Venture, pages 1–2
  - Create the Venture, pages 1–2
  - ENT Project B, pages 1–2
  - ENT Project C, pages 1–2
  - Managing the Venture, pages 1–2
  - Expanding the Venture, pages 1–2
  - ENT Project D, pages 1–2
  - ENT Project E, pages 1–2.
- **Financial Management** – Insert the following **new** Financial Management courses, following new ENT Project E, page 2:
  - Personal Financial Information, pages 1–2
  - Accounting Prep, pages 1–2
  - Accounting Cycle 1, page 1
  - Accounting Cycle 2, pages 1–2
  - FIN Project A, pages 1–2
  - Retail Accounting 1, page 1
  - Retail Accounting 2, page 1
  - Accounting Software, page 1
  - Personal Taxation, pages 1–2
  - Payroll Accounting, pages 1–2
  - FIN Project B, pages 1–2
  - FIN Project C, pages 1–2
  - Advanced Accounting, pages 1–2
  - Management Accounting, pages 1–2
  - Capital Accounting, pages 1–2
  - Financial Statements, pages 1–2
  - Small Business Taxation, pages 1–2
  - Financial Analysis, page 1
  - Financial Planning, pages 1–2
  - Personal Investment Planning 1, pages 1–3
  - Personal Investment Planning 2, pages 1–3
  - FIN Project D, pages 1–2
  - FIN Project E, pages 1–2.
- **Information Processing** – Insert the following **new** Information Processing courses, following new FIN Project E, page 2:
  - Word Processing 1, pages 1–2
  - Database 1, pages 1–2
  - Spreadsheet 1, pages 1–2
  - Digital Presentation, pages 1–3
  - INF Project A, pages 1–2
  - Keyboarding, page 1
  - Word Processing 2, pages 1–2

*(continued)*



- Database 2, pages 1–2
- Spreadsheet 2, pages 1–2
- Correspondence, pages 1–2
- Reports, pages 1–2
- INF Project B, pages 1–2
- INF Project C, pages 1–2
- Hardware & Software Analysis, pages 1–2
- Word Processing 3, pages 1–2
- Project Management Tools, pages 1–2
- Productivity Software Integration, pages 1–2
- INF Project D, pages 1–2
- INF Project E, pages 1–2
- **Management and Marketing** – Insert the following **new** Management and Marketing courses, following new INF Project E, page 2:
  - Marketing & Management, pages 1–2
  - Quality Customer Service, pages 1–2
  - Communication Strategies 1, pages 1–2
  - E-commerce 1, pages 1–3
  - Agriculture Consumer Projects & Services, pages 1–2
  - MAM Project A, pages 1–2
  - Managing for Quality, pages 1–2
  - Visual Merchandising, pages 1–2
  - Retail Operations, pages 1–2
  - Office Systems 1, pages 1–2
  - Communication Strategies 2, pages 1–2
  - Records Management 1, pages 1–2
  - Promotion: Print Advertising, pages 1–2
  - E-commerce 2, pages 1–4
  - Energy & Resources Supply & Distribution, pages 1–2
  - MAM Project B, pages 1–2
  - MAM Project C, pages 1–2
  - The Business Organization, pages 1–2
  - Business in the Canadian Economy, pages 1–2
  - Business in the Global Marketplace, pages 1–3
  - Promotion: Sales Techniques, pages 1–2
  - Distributing Goods & Services, pages 1–2
  - Setting Up a Retail Store, pages 1–2
  - Office Systems 2, pages 1–2
  - Communication Strategies 3, pages 1–2
  - Records Management 2, pages 1–2
  - Promotion: Broadcast Advertising, pages 1–2
  - E-commerce 3, pages 1–3
  - Agriculture Marketing, pages 1–3
  - Energy & Resources Market Basics & Trends 2, pages 1–2
  - The Forest Marketplace, pages 1–2
  - MAM Project D, pages 1–2
  - MAM Project E, pages 1–2

*(continued)*



- **Networking** – Insert the following **new** Networking courses, following new MAM Project E, page 2:
  - Digital Technology 1, pages 1–2
  - NET Project A, pages 1–2
  - Digital Technology 2, pages 1–2
  - Workstation Technology & Operations, pages 1–3
  - Network Structures, pages 1–3
  - Network Media & Devices, pages 1–3
  - Open System Interconnection, pages 1–4
  - Network Protocols, pages 1–3
  - Local Area Networks, pages 1–3
  - Laptops & Peripherals, pages 1–2
  - Telecommunications 1, pages 1–2
  - Net Project B, pages 1–2
  - Net Project C, pages 1–2
  - Digital Technology 3, page 1
  - Digital Applications, pages 1–2
  - Microprocessors, pages 1–2
  - Microprocessor Interface, pages 1–3
  - Network Operating Systems, pages 1–3
  - Wide Area Networks, pages 1–3
  - Routing Fundamentals, pages 1–3
  - Internet Processes, pages 1–2
  - Network Management, pages 1–3
  - Network Media & Devices, Security, pages 1–5
  - Telecommunications 2, pages 1–2
  - Net Project D, pages 1–2
  - Net Project E, pages 1–2.

### 3. **TRADES, MANUFACTURING & TRANSPORTATION (TMT)**

- Insert **new** Trades, Manufacturing & Transportation (TMT), page 1, following the **new** Net Project E, page 2.
- **Construction** – Insert the following **new** Construction courses, following Trades, Manufacturing & Transportation (TMT), page 1:
  - Construction Tools & Materials, pages 1–2
  - Building Construction, pages 1–2
  - Product Management, pages 1–2
  - Solid Stock Construction, pages 1–2
  - Turning Operations, pages 1–2
  - Manufactured Materials, pages 1–2
  - Mould Making & Casting, pages 1–2
  - CON Project A, pages 1–2
  - Site Preparation, page 1
  - Concrete Forming, pages 1–2
  - Alternative Foundations, pages 1–2
  - Floor Framing Systems, pages 1–2
  - Wall Framing Systems, pages 1–2
  - Roof Structures 1 (Framing & Finishing), pages 1–2
  - Exterior Finishing (Door, Window & Siding), pages 1–2
  - Electrical Systems, pages 1–2

*(continued)*

- Plumbing Systems, pages 1–2
- Climate Control Systems, pages 1–2
- Agri-structures, pages 1–2
- Multiple Materials, pages 1–2
- Furniture Making 1 (Box Construction), pages 1–2
- Furniture Making 2 (Frame & Panel), pages 1–2
- Finishing & Refinishing, pages 1–2
- Cabinetmaking 1 (Web & Face Frame), pages 1–2
- Cabinetmaking 2 (Door & Drawer), pages 1–2
- Wood Forming, pages 1–2
- Manufacturing Systems, pages 1–2
- Product Development, pages 1–2
- CON Project B, pages 1–2
- CON Project C, pages 1–2
- Concrete Work (Structures & Finishes), pages 1–2
- Masonry Work (Structures & Finishes), pages 1–2
- Wall & Ceiling Finishing, pages 1–2
- Stair Construction, pages 1–2
- Roof Structures 2 (Framing & Covering), pages 1–2
- Doors & Trim, pages 1–2
- Floorcovering, pages 1–2
- Energy-efficient Housing, page 1
- Renovations/Restorations, pages 1–2
- Commercial Structures, pages 1–2
- Site Management, pages 1–2
- Tool Maintenance, pages 1–2
- Furniture Making 3 (Leg & Rail), pages 1–2
- Furniture Making 4 (Surface Enhancement), pages 1–2
- Furniture Repair, pages 1–2
- Cabinetmaking 3 (Cabinets/Countertops) pages 1–2
- Cabinetmaking 4 (Layout & Installation), page 1
- Production Planning, pages 1–2
- Production Management, pages 1–2
- Framing Systems 2 (Floor, Wall & Ceiling), pages 1–2
- CON Project D, pages 1–2
- CON Project E, pages 1–2
- Introduction to Work Site Safety, pages 1–3
- Basic Hand, Power Tools & Safety, pages 1–3
- Construction Materials & Processes, pages 1–3
- Site Preparation & Floor Systems, pages 1–3
- Foundations & Concrete Structures, pages 1–3
- Blueprint Drawings & Sketching, pages 1–3
- Construction Machines, Tools & Equipment, pages 1–3
- Blueprint Interpretation, pages 1–2
- CRA Practicum Course A, pages 1–2
- CRA Practicum Course B, pages 1–2
- CRA Practicum Course C, pages 1–2
- CRA Practicum Course D, pages 1–2

*(continued)*



- **Electro-Technologies** – Insert the following **new** Electro-Technologies courses, following the new CRA Practicum Course D, page 2:
  - Electro-assembly 1, pages 1–2
  - Conversion & Distribution, pages 1–2
  - Electronic Power Supply 1, pages 1–2
  - Control Systems 1, pages 1–2
  - Analog Communication 1, pages 1–2
  - Security Systems 1, pages 1–2
  - Robotics 1, page 1
  - Robotics Applications 1, pages 1–2
  - ELT Project A, pages 1–2
  - Electro-assembly 2, page 1
  - Electrical Servicing, pages 1–2
  - Branch Circuit Wiring, pages 1–2
  - Electronic Power Supply 2, pages 1–2
  - Control Systems 2, pages 1–2
  - Analog Communication 2, pages 1–2
  - Security Systems 2, pages 1–2
  - Electro-optics, pages 1–3
  - Magnetic Control Devices, page 1
  - Robotics 2, pages 1–2
  - Electronic Controls, pages 1–2
  - Robotics Sensor 1, pages 1–2
  - Robotics Sensor 2, pages 1–2
  - Process Control, pages 1–2
  - ELT Project B, pages 1–2
  - ELT Project C, pages 1–2
  - Electro-assembly 3, pages 1–2
  - Electronic Servicing, pages 1–2
  - Power Systems & Services, pages 1–2
  - Generation/Transformation, pages 1–2
  - Amplifiers, pages 1–2
  - Motors, pages 1–2
  - Robotics 3, pages 1–2
  - Control Applications, pages 1–2
  - Robotics Microprocessors, pages 1–2
  - Robotics Vision Systems, pages 1–2
  - Robotics Kinematics & Behaviour, pages 1–2
  - Robotics Artificial Intelligence, pages 1–2
  - Expert Systems, pages 1–2
  - ELT Project D, pages 1–2
  - ELT Project E, pages 1–2
- **Fabrication** – Insert the following **new** Fabrication courses, following the new ELT Project E, page 2:
  - Fabrication Tools & Materials, pages 1–2
  - Oxyacetylene Welding, pages 1–2
  - Semi-automated/Automated Welding, pages 1–3
  - Basic Electric Welding, pages 1–2

*(continued)*

- Sheet Fabrication 1 (Hand Processes), pages 1–2
- Fabrication Principles, pages 1–2
- Bar & Tubular Fabrication, pages 1–2
- Foundry 1 (One-piece Pattern), pages 1–2
- Principles of Machining, pages 1–2
- Production Systems, pages 1–2
- FAB Project A, pages 1–2
- Structural Engineering, pages 1–2
- Print Reading, pages 1–2
- Oxyfuel Welding, pages 1–2
- Thermal Cutting, pages 1–2
- Flux Cored Arc Welding 1, pages 1–2
- Arc Welding 1, pages 1–2
- Arc Welding 2, pages 1–2
- Gas Metal Arc Welding 1, pages 1–2
- Sheet Fabrication 2 (Machine Processes), pages 1–2
- Sheet Fabrication 3 (Parallel Line), pages 1–2
- Forging Fundamentals, pages 1–2
- Foundry 2 (Split Pattern), pages 1–2
- Precision Turning 1, pages 1–2
- Precision Milling 1, pages 1–2
- CNC Turning (Computer Numerical Control), pages 1–2
- Custom Fabrication, pages 1–2
- Pipe Fitting, pages 1–2
- FAB Project B, pages 1–2
- FAB Project C, pages 1–2
- Materials Testing, pages 1–2
- Metallurgy Fundamentals, pages 1–2
- Gas Tungsten Arc Welding, pages 1–2
- Specialized Welding, pages 1–2
- Flux Cored Arc Welding 2, pages 1–2
- Arc Welding 3, pages 1–2
- Arc Welding 4, pages 1–2
- Pipe & Tubular Welding, pages 1–2
- Automated Welding, pages 1–2
- Sheet Fabrication 4 (Radial Line), pages 1–2
- Sheet Fabrication 5 (Duct Components), pages 1–2
- Foundry 3 (Core Moulding), pages 1–2
- Precision Turning 2, pages 1–2
- Precision Milling 2, pages 1–2
- CNC Milling (Computer Numerical Control), pages 1–2
- Prefabrication Principles, pages 1–2
- Gas Metal Arc Welding 2, pages 1–2
- FAB Project D, pages 1–2
- FAB Project E, pages 1–2
- Fabrication Orientation & Safety, pages 1–2
- Fabrication Tools & Weld Faults, pages 1–3
- Oxyfuel Welding, pages 1–3
- Gas Metal Arc Welding, pages 1–3
- Flux Cored Arc Welding & Submerged Arc Welding, pages 1–3

(continued)



- Materials Handling, pages 1–2
- Shielded Metal Arc Welding (Part 1), pages 1–2
- Shielded Metal Arc Welding (Part 2), pages 1–2
- Shop/Lab Practices for GMAW, FCAW & SAW, pages 1–3
- OAW Cutting Practical, pages 1–2
- GMAW & FCAW Practical, pages 1–2
- SMAW Practical, pages 1–2
- WDA Practicum Course A, pages 1–2
- **Logistics** – Insert the following **new** Logistics courses, following the new WDA Practicum Course A, page 2:
  - Logistics, pages 1–2
  - Warehouse & Distribute 1, pages 1–2
  - Traffic & Transport 1, pages 1–2
  - Purchasing 1, pages 1–2
  - LOG Project A, pages 1–2
  - Warehouse & Distribute 2, pages 1–2
  - Traffic & Transport 2, pages 1–2
  - Purchasing 2, pages 1–2
  - Inventory Management 1, pages 1–2
  - LOG Project B, pages 1–2
  - LOG Project C, pages 1–2
  - Warehouse & Distribute 3, pages 1–2
  - Traffic & Transport 3, pages 1–2
  - Purchasing 3, pages 1–2
  - Inventory Management 2, pages 1–2
  - LOG Project D, pages 1–2
  - LOG Project E, pages 1–2
- **Mechanics** – Insert the following **new** Mechanics courses, following the new LOG Project E, page 2:
  - Modes & Mechanisms, pages 1–2
  - Mechanics Tools & Materials, pages 1–3
  - Vehicle Service & Care, pages 1–3
  - Engine Fundamentals, pages 1–2
  - Electrical Fundamentals, pages 1–2
  - Pneumatics & Hydraulics, pages 1–2
  - Mechanical Systems, pages 1–2
  - Ride & Control Systems, pages 1–2
  - Structures & Materials, pages 1–2
  - Mechanics Welding Fundamentals, pages 1–3
  - Metal Forming & Finishing, pages 1–2
  - Surface Preparation 1, pages 1–2
  - MEC Project A, pages 1–2
  - Vehicle Detailing, pages 1–2
  - Vehicle Maintenance, pages 1–2
  - Lubrication & Cooling, pages 1–2
  - Fuel & Exhaust Systems, pages 1–2
  - Alternative Fuel Engines, pages 1–2
  - Ignition Systems, pages 1–2

*(continued)*

- Emission Controls, pages 1–2
- Electrical Components, pages 1–2
- Power Assist Accessories, pages 1–2
- Braking Systems, pages 1–2
- Hydraulic Accessories, pages 1–2
- Drive Line, pages 1–2
- Transmissions/Transaxles, pages 1–2
- Suspension Systems, pages 1–2
- Steering Systems, pages 1–2
- Metal Repair & Finishing, page 1
- Trim Replacement, pages 1–2
- Surface Preparation 2, page 1
- Refinishing 1, pages 1–2
- Touch-up & Finishing, pages 1–2
- Interior Repairs, pages 1–2
- MEC Project B, pages 1–2
- MEC Project C, pages 1–2
- Buying & Selling Vehicles, pages 1–2
- Vehicle Value Appraisal, pages 1–2
- Engine Diagnosis, pages 1–2
- Engine Tune-up, pages 1–2
- Engine Replacement, pages 1–2
- Engine Reconditioning 1, pages 1–2
- Engine Reconditioning 2, pages 1–2
- Alternative Energy Systems, pages 1–2
- Computer Systems, pages 1–2
- Safety Systems, page 1
- Climate Control, pages 1–2
- Power Assisting, pages 1–2
- Automatic Transmissions, pages 1–2
- Drive Train Repair, pages 1–2
- Wheel Alignment, pages 1–2
- Body Repair Estimation, pages 1–2
- Damage Analysis, pages 1–2
- Damage Repair 1, pages 1–2
- Damage Repair 2, pages 1–2
- Refinishing 2, pages 1–2
- Plastic & Fibreglass, pages 1–2
- Glass Replacement, page 1
- Refinishing 3, pages 1–2
- MEC Project D, pages 1–2
- MEC Project E, pages 1–2
- Basic Tools & Materials, pages 1–2
- Electrical Fundamentals, pages 1–2
- Electrical Circuits & Diagnosis, pages 1–2
- Frames, Suspension & Steering Linkages, pages 1–2
- Manual & Power Steering Systems, pages 1–2
- Steering Angles, Steering Columns & Restraint Systems, pages 1–3
- Wheel Alignment Procedures, pages 1–2
- Braking Systems I, pages 1–2

(continued)

- Braking Systems II, pages 1–2
- Braking Systems III, pages 1–2
- Drivelines & Introductory Welding, pages 1–2
- ASA Practicum Course A, pages 1–2
- ASA Practicum Course B, pages 1–2
- ASA Practicum Course C, pages 1–2
- ASA Practicum Course D, pages 1–2





# **CAREER AND TECHNOLOGY STUDIES**

## **CONTENTS**

Career and Technology Studies [applies to all 22 strands]

Agriculture

Career Transitions

Communication Technology

Community Health

Cosmetology Studies

Design Studies

Energy and Mines

Fashion Studies

Foods

Forestry

Information Processing

Legal Studies

Tourism Studies

Wildlife

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## PROGRAM OUTCOMES

The program outcomes describe the basic competencies integrated throughout the CTS program.

Within an applied context relevant to personal goals, aptitudes and abilities; *the student* in CTS will:

- demonstrate the basic knowledge, skills and attitudes necessary for achievement and fulfillment in personal life
- develop an action plan that relates personal interests, abilities and aptitudes to career opportunities and requirements
- use technology effectively to link and apply appropriate tools, management and processes to produce a desired outcome
- develop basic competencies (employability skills), by:
  - selecting relevant, goal-related activities, ranking them in order of importance, allocating necessary time, and preparing and following schedules (managing learning)
  - linking theory and practice, using resources, tools, technology and processes responsibly and efficiently (managing resources)
  - applying effective and innovative decision-making and problem-solving strategies in the design, production, marketing and consumption of goods and services (problem solving and innovation)
  - demonstrating appropriate written and verbal skills, such as composition, summarization and presentation (communicating effectively)
  - participating as a team member by working cooperatively with others and contributing to the group with ideas, suggestions and effort (working with others)

- maintaining high standards of ethics, diligence, attendance and punctuality, following safe procedures consistently, and recognizing and eliminating potential hazards (demonstrating responsibility).

## PROGRAM ORGANIZATION

### CURRICULUM STRUCTURE

Career and Technology Studies is organized into **strands** and **courses**.

**Strands** in CTS define competencies that help students:

- build daily living skills
- investigate career options
- use technology (managing, processes, tools) effectively and efficiently
- prepare for entry into the workplace and/or related post-secondary programs.

In general, strands relate to selected industry sectors offering positive occupational opportunities for students. Some occupational opportunities require further education after high school, and some allow direct entry into the workplace. Industry sectors encompass goods-producing industries, such as agriculture, manufacturing and construction; and service-producing industries, such as business, health, finance and insurance.

**Courses** are the building blocks for each strand. They define what a student is expected to know and be able to do (exit-level *competencies*). Courses also specify prerequisites. Recommendations for course parameters, such as instructional qualifications, facilities and equipment can be found in the guides to implementation.

The competencies a student must demonstrate to achieve success in a course are defined through *general outcomes*. Senior high school students who can demonstrate the general outcomes defined for a CTS course; i.e., who have the designated competencies, will qualify for 1 credit toward their high school diploma.

*Specific outcomes* provide a more detailed framework for instruction. Within the context of the general outcomes, the specific outcomes further define the knowledge, skills and attitudes the student should acquire.

The following chart shows the 22 strands that comprise the CTS program and the number of 1-credit courses available in each strand.

Strand	No. of Courses
Agriculture	29
Career Transitions	30
Communication Technology	33
Community Health	31
Cosmetology Studies	58
Design Studies	31
Energy and Mines	24
Fashion Studies	29
Foods	37
Forestry	20
Information Processing	8
Legal Studies	13
Tourism Studies	24
Wildlife	17

## LEVELS OF ACHIEVEMENT

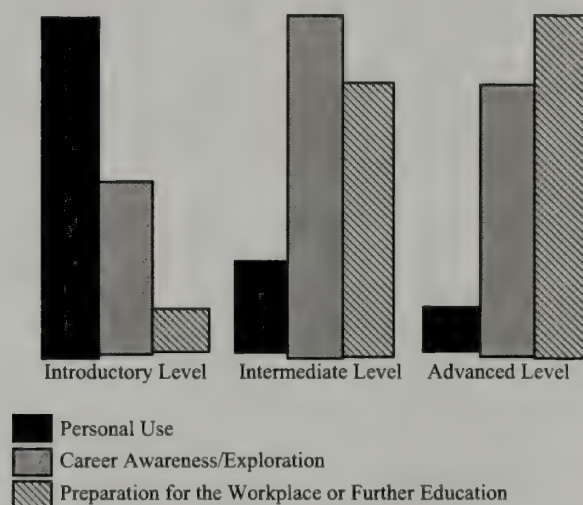
Courses are organized into three levels of achievement: **introductory**, **intermediate** and **advanced**. As students progress through the levels, they will be expected to meet higher standards and demonstrate an increased degree of competence, in both the program outcomes and the general outcomes defined for individual courses.

**Introductory** level courses help students build daily living skills and form the basis for further learning. Introductory courses are for students who have no previous experience in the strand.

**Intermediate** level courses build on the competencies developed at the introductory level. They provide a broader perspective, helping students recognize the wide range of related career opportunities available within the strand.

**Advanced** level courses refine expertise and help prepare students for entry into the workplace or a related post-secondary program.

The graph below illustrates the relative emphasis on the aspects of career planning at each of the levels.





# AGRICULTURE

## B. STRAND RATIONALE AND PHILOSOPHY

Agriculture is a diverse endeavour involving both rural and urban communities. It affects the quality of life of all Albertans. Agriculture encompasses not only the direct production of primary goods, but also the processing and service industries. It is the second most important area of economic activity in Alberta.★

Agriculture involves using our most basic resources: soil, water, plants, animals and people. Concern for the environment provides continuing incentive for new technologies and methods of managing interactions among these resources. Industry practices must ensure the sustainable use of natural resources.

Agriculture, a strand in Career and Technology Studies, provides a comprehensive view of agriculture in Alberta. It encompasses plant and animal production, interior and exterior plantscape, animal husbandry, the agrifood industry, market research and development, and environmental management. Students will develop first-hand knowledge of practices within Alberta's agriculture industries and will apply this knowledge in producing agriculture products and providing related services.



Students in Agriculture will develop the knowledge, skills, attitudes, motivation and commitment to work individually and collectively, as private citizens and members of the work force, toward the conservation and responsible use of water, land, air, forests and wildlife. Within the philosophy of Career and Technology Studies, *students in Agriculture will:*

- develop greater awareness of the economic, environmental and social significance of agriculture in Alberta and the rest of the world, and develop awareness of factors affecting industry decisions

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★ *Agriculture in Alberta*. Edmonton, AB: Alberta Agriculture, Food and Rural Development, 1993.

- describe the characteristics of Alberta's agriculture and horticulture industries, and identify resulting products and services
- describe technologies and research programs that support sustainable agriculture systems and that enhance the development of a range of products and services
- develop competencies and behaviours that have broad application to environmental career paths, and specific application to careers within Alberta's agriculture and horticulture industries.

## SCOPE AND SEQUENCE

INTRODUCTORY	INTERMEDIATE	ADVANCED	THEME
<div>Agriculture: The Big Picture★ <i>AGR1010</i></div>	<div>Animal Husbandry/Welfare <i>AGR2020</i></div>	<div>Issues in Agriculture <i>AGR3010</i></div>	Social and Cultural Perspectives
<div>Production Basics <i>AGR1030</i></div>	<div>Field Crops 1 (Materials &amp; Processes) <i>AGR2030</i></div> <div>Nursery/Greenhouse Crops 1 (Materials &amp; Processes) <i>AGR2140</i></div> <div>Livestock/Poultry 1 (Materials &amp; Processes) <i>AGR2040</i></div> <div>Equine 1 (Materials &amp; Processes) <i>AGR2070</i></div> <div>Agrifoods 1 (Materials &amp; Processes) <i>AGR2050</i></div> <div>Landscape/Turf Management 1 (Maintenance Practices) <i>AGR2060</i></div> <div>Floral Design 1 (Projects for All Occasions) <i>AGR2080</i></div> <div>Protected Structures <i>AGR2100</i></div>	<div>Field Crops 2 (Management Techniques) <i>AGR3030</i></div> <div>Nursery/Greenhouse Crops 2 (Management Techniques) <i>AGR3140</i></div> <div>Livestock/Poultry 2 (Management Techniques) <i>AGR3040</i></div> <div>Equine 2 (Management Techniques) <i>AGR3070</i></div> <div>Agrifoods 2 (Standards &amp; Regulation) <i>AGR3050</i></div> <div>Landscape/Turf Management 2 (Installation &amp; Repair) <i>AGR3060</i></div> <div>Floral Design 2 (Creative Design &amp; Display) <i>AGR3080</i></div> <div>Biotechnology <i>AGR3100</i></div>	Technology and Applications
<div>Basic Landscape/Turf Care <i>AGR1070</i></div> <div>Basic Floral Design <i>AGR1080</i></div> <div>Agriculture Technology <i>AGR1100</i></div>			
<div>Resource Management <i>AGR1110</i></div>	<div>Soils Management 1 (Soil Properties/Classification) <i>AGR2120</i></div> <div>Integrated Pest Management <i>AGR2130</i></div>	<div>Water Management <i>AGR3110</i></div> <div>Soils Management 2 (Soil Testing &amp; Amending) <i>AGR3120</i></div> <div>Sustainable Agriculture Systems <i>AGR3130</i></div>	Management and Conservation

—— Prerequisite

----- Recommended sequence

★ Course provides a strong foundation for further learning in this strand.



## GENERAL OUTCOMES: INTRODUCTORY LEVEL

### COURSE AGR1010: AGRICULTURE: THE BIG PICTURE

**Level:** Introductory

**Theme:** Social and Cultural Perspectives

**Prerequisite:** None

**Description:** Students demonstrate knowledge of the diversity and significance of agriculture, and they identify career opportunities within the industry.

**General Outcomes:** *The student will:*

- describe the diversity of agriculture activity in Alberta, Canada and the global community
- explain the economic, environmental and social significance of agriculture
- identify career opportunities relevant to the agriculture industry
- demonstrate basic competencies.

### COURSE AGR1030: PRODUCTION BASICS

**Level:** Introductory

**Theme:** Technology and Applications

**Prerequisite:** None

**Description:** Students demonstrate the basic steps involved in planting, growing and harvesting a plant commodity or in raising, growing and finishing an animal commodity; and they identify related career opportunities.

**General Outcomes:** *The student will:*

- identify and demonstrate the basic steps and procedures involved in producing a plant or animal commodity
- describe technological systems used within a plant or animal production enterprise
- identify career opportunities relevant to plant or animal production
- demonstrate basic competencies.



## **COURSE AGR1070: BASIC LANDSCAPE/TURF CARE**

**Level:** Introductory

**Theme:** Technology and Applications

**Prerequisite:** None

**Description:** Students demonstrate knowledge of the techniques used to perform basic landscape and turf care services, focusing attention on plant identification, equipment and supplies and basic maintenance tasks; and they identify related career opportunities.

**General Outcomes:** *The student will:*

- identify plants suitable for use in Alberta landscapes
- describe equipment and supplies used in performing basic landscape and turf-care services
- demonstrate practical skills in performing basic landscape and turf-care services
- identify career opportunities relevant to landscape and turf maintenance
- demonstrate basic competencies.

## **COURSE AGR1080: BASIC FLORAL DESIGN**

**Level:** Introductory

**Theme:** Technology and Applications

**Prerequisite:** None

**Description:** Students demonstrate knowledge of the techniques used to construct basic floral designs and arrangements, focusing attention on plant and flower identification, care and handling of fresh cut flowers and foliage, and simple fresh/dried/artificial arrangements; and they identify related career opportunities.

**General Outcomes:** *The student will:*

- identify and explain the cultural requirements of cut flowers, foliage and interior plants
- demonstrate appropriate care and handling of fresh cut flowers and foliage
- construct simple floral arrangements
- identify career opportunities relevant to the retail florist industry
- demonstrate basic competencies.

## **COURSE AGR1100: AGRICULTURE TECHNOLOGY**

**Level:** Introductory

**Theme:** Technology and Applications

**Prerequisite:** None

**Description:** Students describe applications of science and technology within an agriculture or horticulture industry.

**General Outcomes:** *The student will:*

- explain how science and technology influence the development of agriculture products, methods and services
- describe current applications of science and technology in agriculture production, processing and marketing
- design a simple technological system that addresses a current need in agriculture
- demonstrate basic competencies.

## **COURSE AGR1110: RESOURCE MANAGEMENT**

**Level:** Introductory

**Theme:** Management and Conservation

**Prerequisite:** None

**Description:** Students describe the practices used to manage water, soil and land use; and they present the results of research on one or more related issues in agriculture.

**General Outcomes:** *The student will:*

- describe the nature and extent of Alberta's water resource, and explain practices for managing its use
- describe the nature and characteristics of soil in Alberta, and explain practices for managing its use
- explain different uses of land in rural and urban Alberta and the factors upon which land use decisions are made
- identify alternatives and consequences associated with one or more issues involving water, soil or land use in agriculture
- demonstrate basic competencies.

## **COURSE AGR2060: LANDSCAPE/TURF MANAGEMENT 1 (MAINTENANCE PRACTICES)**

**Level:** Intermediate

**Theme:** Technology and Applications

**Prerequisite:** AGR1070 Basic Landscape/Turf Care

**Description:** Students demonstrate the techniques used to provide landscape and turf maintenance services, focusing attention on plant identification, equipment maintenance, effective landscape practices, cost analysis and pricing. Potential areas of specialization include home landscapes, golf courses, recreational fields and parks, institutional/industrial grounds and roadside landscapes.

**General Outcomes:** *The student will:*

- identify plants suitable for use in Alberta landscapes
- perform routine maintenance and safety checks on equipment used in landscape practices
- demonstrate practical skills in installing and maintaining landscape plants and turfgrass
- explain techniques used to cost landscape and turfgrass services
- demonstrate basic competencies.

## **COURSE AGR2070: EQUINE 1 (MATERIALS & PROCESSES)**

**Level:** Intermediate

**Theme:** Technology and Applications

**Prerequisite:** None

**Description:** Students demonstrate practical skills and approved practices in providing for the daily care of a horse, focusing attention on the origin and history of horses, anatomy and conformation, types and breeds, handling and feeding practices, and basic health care; and they identify related career opportunities.

**General Outcomes:** *The student will:*

- describe the significance, origin and conformational features of the horse
- identify the types, breeds and characteristics of horses
- demonstrate practical skills and approved procedures for horse handling, feeding and health care
- describe career opportunities relevant to the care, breeding and training of horses
- demonstrate basic competencies.

## **COURSE AGR2080: FLORAL DESIGN 1 (PROJECTS FOR ALL OCCASIONS)**

**Level:** Intermediate

**Theme:** Technology and Applications

**Prerequisite:** AGR1080 Basic Floral Design

**Description:** Students demonstrate knowledge of the practices involved in providing floral design and interior plantscape services, focusing attention on plant and flower identification, elements and principles of design, floral projects for all occasions, interior plant care and marketing practices.

**General Outcomes:** *The student will:*

- identify and explain the cultural requirements of cut flowers, foliage and interior plants
- construct fresh, dried and/or artificial floral arrangements
- demonstrate practical skills in maintaining indoor plantscapes
- explain techniques used to cost products within the floral industry
- demonstrate basic competencies.



## **COURSE AGR3060: LANDSCAPE/TURF MANAGEMENT 2 (INSTALLATION & REPAIR)**

**Level:** Advanced

**Theme:** Technology and Applications

**Prerequisite:** AGR2060 Landscape/Turf Management 1 (Maintenance Practices)

**Description:** Students demonstrate the techniques used to provide landscape and turf management services, focusing attention on plant identification, effective maintenance practices, diagnosis and correction of problems, installation of specialty items, cost analysis and seasonal estimates. Potential areas of specialization include home landscapes, golf courses, recreational fields and parks, institutional/industrial grounds and roadside landscapes.

**General Outcomes:** *The student will:*

- identify plants suitable for use in Alberta landscapes
- demonstrate practical skills in installing, maintaining and managing landscape plants and turfgrass
- develop and present a plan for the installation of a specialty item and/or system within an Alberta landscape
- estimate the cost of providing seasonal landscape and/or turfgrass services
- demonstrate basic competencies.

## **COURSE AGR3070: EQUINE 2 (MANAGEMENT TECHNIQUES)**

**Level:** Advanced

**Theme:** Technology and Applications

**Prerequisite:** AGR2070 Equine 1 (Materials & Processes)

**Description:** Students demonstrate practical skills and approved practices in providing for the daily care of a horse, focusing attention on the use of physical facilities, procedures for stall cleaning and bedding a horse, guidelines for turnout and shelter, reproductive fundamentals and techniques, and basic horsemanship.

**General Outcomes:** *The student will:*

- identify factors to consider in selecting a stable and other physical facilities
- demonstrate practical skills and approved procedures for stall cleaning, bedding a horse, turnout and shelter
- describe the reproductive cycle of horses, and describe basic techniques of equine reproduction
- demonstrate approved horsemanship techniques
- demonstrate basic competencies.

## **COURSE AGR3080: FLORAL DESIGN 2 (CREATIVE DESIGN & DISPLAY)**

**Level:** Advanced

**Theme:** Technology and Applications

**Prerequisite:** AGR2080 Floral Design 1 (Projects for All Occasions)

**Description:** Students demonstrate knowledge of the practices involved in providing creative floral design services, focusing attention on plant and flower identification, more advanced design techniques, floral services for special occasions and promotional displays of floral services offered.

**General Outcomes:** *The student will:*

- identify and explain the cultural requirements of cut flowers, foliage and interior plants
- construct fresh, dried and/or artificial floral arrangements for special occasions
- calculate the cost and selling price of floral products and services
- demonstrate techniques used to promote products and services within the floral industry
- demonstrate basic competencies.

# ENERGY AND MINES

## B. STRAND RATIONALE AND PHILOSOPHY

Alberta's hydrocarbon resources are primary energy sources for Alberta and the rest of Canada and contribute to an important export market. Because our province is so richly endowed with oil, gas, oil sands, heavy oil and coal, the exploration, recovery, production, marketing and management of these resources will likely continue to provide a major contribution to Alberta's economy for the foreseeable future.★

Although Alberta owes much of its present development, lifestyle and demographics to the development of fossil fuels, these resources may, over time, become less readily available and more costly to develop and use. Furthermore, public concern for the environment at local and global levels has expanded to embrace practices that ensure sustainable energy use. The development of renewable energy—the energy generated by water, wind, sun, biomass, waste material and geothermal sources—has the potential to extend the life of Alberta's fossil fuels and supplement conventional energy supplies in specific regions of the province.

The potential of the minerals sector in Alberta has not been fully determined, nor have known deposits been fully developed. In the future, development of metallic, nonmetallic and structural materials could be profoundly important

to economic diversification, employment and technological development in Alberta. At present, the recovery and production of minerals for industrial applications have significant effects on Alberta's economy.

Energy and Mines, a strand in Career and Technology Studies, provides a comprehensive view of energy and mineral development in Alberta and Canada. It encompasses resource exploration, recovery, production, marketing and management. Conservation is viewed throughout the strand as a process for managing human use of natural resources to ensure such use is sustainable. Students will develop first-hand knowledge of practices specific to Alberta's energy and mineral industries and will examine technologies that support sustainable development and efficient use of natural resources.



★ *Alberta in the Global Energy Spectrum*. Edmonton, AB: Alberta Energy Information Centre, Government of Alberta, 1995.



Students in Energy and Mines will develop the knowledge, skills, attitudes, motivation and commitment to work individually and collectively, as private citizens and members of the work force, toward the conservation and responsible use of water, land, air, forests and wildlife. Within the philosophy of Career and Technology Studies, *students in Energy and Mines will:*

- develop greater awareness of the economic, environmental and social significance of energy and mineral resources in Alberta and the rest of the world, and develop awareness of factors affecting industry decisions
- describe the characteristics of energy and mineral development in Alberta and Canada, and identify resulting products and services
- describe technologies and research programs designed to enhance the development of a range of products and services and to achieve sustainable use of natural resources
- translate sustainable development and conservation goals into viable plans for developing products and services
- develop competencies and behaviours that have broad application to environmental career paths, and specific application to careers within Alberta's energy and mineral industries.

## SCOPE AND SEQUENCE

INTRODUCTORY	INTERMEDIATE	ADVANCED	THEME
<div>Overview of Alberta Geology ★ <i>ENM1010</i></div>	<div>Managing Alberta's Resources <i>ENM2010</i></div>	<div>Energy &amp; the Environment <i>ENM3010</i></div>	Social and Cultural Perspectives
<div>Nonrenewable Resources <i>ENM1020</i></div>	<div>Conventional Oil/Gas 1 (Resource Exploration) <i>ENM2020</i></div> <div>Oil Sands/Heavy Oil/Coal 1 (Resource Exploration) <i>ENM2030</i></div> <div>Metals/Nonmetals 1 (Resource Exploration) <i>ENM2040</i></div>	<div>Conventional Oil/Gas 2 (Recovery &amp; Production) <i>ENM3020</i></div> <div>Oil Sands/Heavy Oil/Coal 2 (Recovery &amp; Production) <i>ENM3030</i></div> <div>Metals/Nonmetals 2 (Recovery &amp; Production) <i>ENM3040</i></div>	Technology and Applications
<div>Renewable Resources <i>ENM1050</i></div>	<div>Renewable Energy Technology <i>ENM2050</i></div>	<div>Sustainable Energy (The Power &amp; Potential) <i>ENM3050</i></div>	
<div>Consumer Products &amp; Services <i>ENM1060</i></div>	<div>Refining Hydrocarbons <i>ENM2060</i></div> <div>Refining Rocks &amp; Minerals <i>ENM2070</i></div>	<div>Petrochemicals <i>ENM3060</i></div> <div>Industrial Materials (Primary Manufacturing) <i>ENM3070</i></div>	
<div>Fundamentals of Recycling <i>ENM1090</i></div>	<div>Energy Designs/Systems 1 (Basic Principles) <i>ENM2090</i></div>	<div>Energy Designs/Systems 2 (Practical Applications) <i>ENM3090</i></div>	
<div>Conservation Challenge <i>ENM1100</i></div>	<div>Environmental Safety <i>ENM2100</i></div>	<div>Integrated Resource Management (Balancing Needs) <i>ENM3100</i></div>	Management and Conservation

\_\_\_\_\_ Prerequisite      - - - - - Recommended sequence

★ Course provides a strong foundation for further learning in this strand.





## **COURSE ENM2050: RENEWABLE ENERGY TECHNOLOGY**

**Level:** Intermediate

**Theme:** Technology and Applications

**Prerequisite:** ENM1050 Renewable Resources

**Description:** Students define and explain the need for sustainable energy development, research one or more renewable energy technologies; e.g., hydro, wind, solar, tidal, biomass, geothermal, nuclear, hydrogen, ethanol, blended fuel, fuel cell, and construct a model of a renewable energy system.

**General Outcomes:** *The student will:*

- explain the role of renewable energy sources in sustainable energy development
- demonstrate applications of one or more renewable energy technologies
- describe career opportunities relevant to renewable energy development
- demonstrate basic competencies.

## **COURSE ENM2060: REFINING HYDROCARBONS**

**Level:** Intermediate

**Theme:** Technology and Applications

**Prerequisite:** None

**Description:** Students examine the principles and technologies involved in processing natural gas, refining crude oil, upgrading heavy oils and bitumen, or processing coal. Students also describe related career opportunities.

**General Outcomes:** *The student will:*

- describe commodity inputs and consumer products characteristic of the hydrocarbon processing industry
- explain techniques used to process natural gas, refine crude oil, upgrade heavy oils and bitumen, or process coal
- describe career opportunities relevant to the processing or refining sector of a hydrocarbon industry
- demonstrate basic competencies.

## **COURSE ENM2070: REFINING ROCKS & MINERALS**

**Level:** Intermediate

**Theme:** Technology and Applications

**Prerequisite:** None

**Description:** Students examine the principles and processes involved in refining an industrial (nonmetallic) mineral or a metallic mineral, and they describe related career opportunities.

**General Outcomes:** *The student will:*

- describe commodity inputs and consumer products characteristic of the mineral processing industry
- explain techniques used to refine an industrial (nonmetallic) mineral or a metallic mineral
- describe career opportunities relevant to the processing sector of a rock or mineral industry
- demonstrate basic competencies.

## **COURSE ENM3090: ENERGY DESIGNS/SYSTEMS 2 (PRACTICAL APPLICATIONS)**

**Level:** Advanced

**Theme:** Management and Conservation

**Prerequisite:** ENM2090 Energy Designs/Systems 1 (Basic Principles)

**Description:** Students analyze energy-saving technologies and systems and design a residential/commercial structure or transportation technology that demonstrates the principles of energy conservation and efficiency.

**General Outcomes:** *The student will:*

- describe energy use within a residential/commercial environment or transportation sector
- design a residential/commercial structure or transportation technology that uses energy conservation and efficiency
- explain career opportunities relevant to energy design and technology
- demonstrate basic competencies.



## **COURSE ENM3100: INTEGRATED RESOURCE MANAGEMENT (BALANCING NEEDS)**

**Level:** Advanced

**Theme:** Management and Conservation

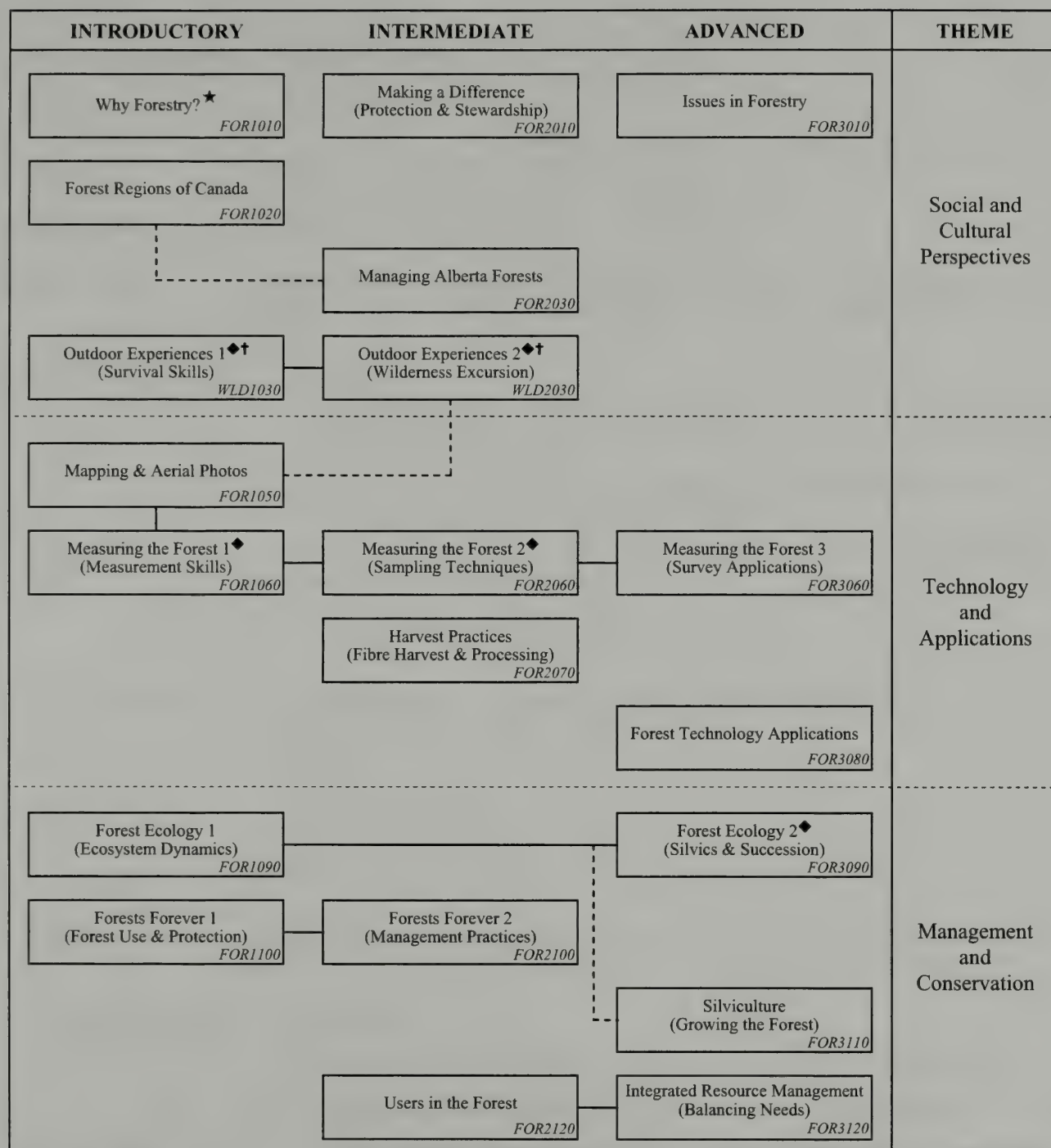
**Prerequisite:** None

**Description:** Students develop and present an integrated plan for sustainable resource development that incorporates supply side and demand side resource management.

**General Outcomes:** *The student will:*

- describe basic principles of resource management
- present a plan for the sustainable development and integrated use of an energy or mineral resource
- explain career opportunities relevant to resource management
- demonstrate basic competencies.

## SCOPE AND SEQUENCE



—— Prerequisite

----- Recommended sequence

★ Course provides a strong foundation for further learning in this strand.

♦ Refer to specific courses for additional prerequisites.

† Course is also offered in Wildlife.





## GENERAL OUTCOMES: ADVANCED LEVEL

### COURSE FOR3010: ISSUES IN FORESTRY

**Level:** Advanced

**Theme:** Social and Cultural Perspectives

**Prerequisite:** None

**Description:** Students analyze current local and global issues in forest management, and demonstrate individual and shared actions that foster environmental stewardship.

**General Outcomes:** *The student will:*

- describe alternatives and consequences associated with current issues in forest management
- compare and contrast issues and trends involving Canada's forests with similar issues and trends in other parts of the world
- demonstrate individual and shared actions that foster the sustainable management of forested regions
- demonstrate basic competencies.

### COURSE FOR3060: MEASURING THE FOREST 3 (SURVEY APPLICATIONS)

**Level:** Advanced

**Theme:** Technology and Applications

**Prerequisite:** FOR2060 Measuring the Forest 2 (Sampling Techniques)

**Description:** Students explain management applications of data collected from a forest survey, and examine the role of technology in current forest inventory practices.

**General Outcomes:** *The student will:*

- explain the applications of forest survey data in resource management
- describe the role of technology in current forest inventory practices
- explain career opportunities relevant to forest measurement
- demonstrate basic competencies.

## **COURSE FOR3080: FOREST TECHNOLOGY APPLICATIONS**

**Level:** Advanced

**Theme:** Technology and Applications

**Prerequisite:** None

**Description:** Students examine research and technological applications in the forest industry, and examine changing career opportunities in the forestry sector.

**General Outcomes:** *The student will:*

- describe different areas of forest research presently being conducted in Canada and Alberta
- cite examples of current and emerging technologies used in the forest industry
- explain career opportunities and trends relevant to the forestry sector
- demonstrate basic competencies.

# INFORMATION PROCESSING

## B. STRAND RATIONALE AND PHILOSOPHY

Information Processing, a strand in Career and Technology Studies, represents the study of electronic technologies as they apply to personal use and the business environment.

As we move more rapidly into the information age, it is crucial that students are able to use electronic technologies to access and manipulate information in an efficient manner. Accurate, timely information is the basis for sound decision making and effective communication.

As students build confidence in their understanding of the various information processing tools and procedures, they will be able to transfer their knowledge and skill to a wide range of contexts. They will also be better able to adapt to the continual changes caused by the evolving technologies.

To understand the shift from the *industrial society* toward the *information age*, it is important that a student understands the significance of the current technological development, of how technology affects an individual's daily life and of the impact that technology has on the world of work. Within this perspective, Information Processing provides for the development of:

- a meaningful study of technological trends
- an understanding of the systems that relate in whole or in part to the management of information
- an understanding of the ethical and societal issues concerning technological development and its impact on society
- technological skills and knowledge designed for personal use
- technological skills and knowledge that transfer to other curriculum areas
- technological skills and knowledge required for the world of work.

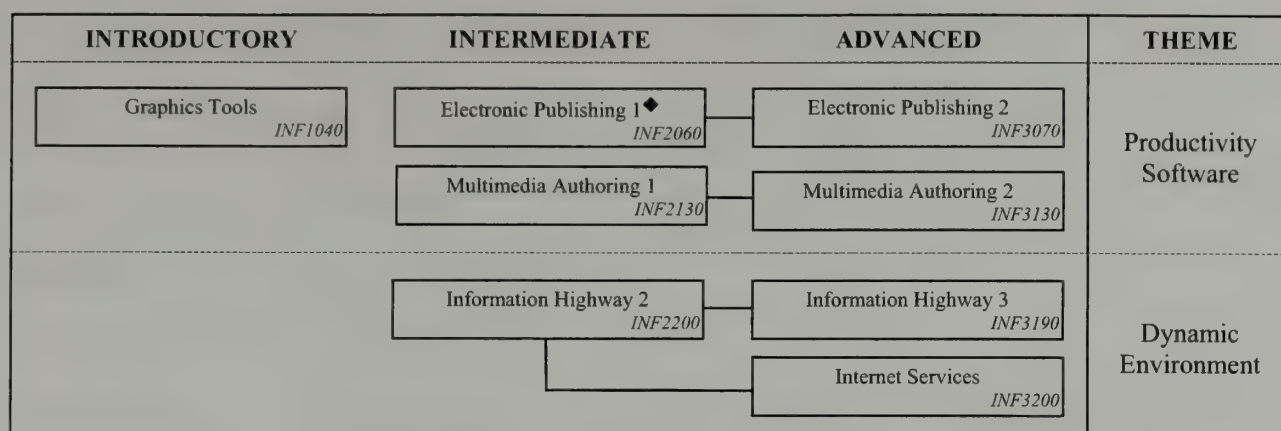
Students will learn to input, process and output information in the following areas:

- text/data input
- productivity software
- dynamic environment.





## SCOPE AND SEQUENCE



—— Prerequisite

----- Recommended sequence

♦ Refer to specific courses for additional prerequisites.





## GENERAL OUTCOMES: INTRODUCTORY LEVEL

### COURSE INF1040: GRAPHICS TOOLS

**Level:** Introductory

**Theme:** Productivity Software

**Prerequisite:** None

**Description:** Students learn the basic commands and functions of computer graphics software, including bitmapped graphics (paint program) and vector graphics (draw program). Students also develop basic skills in manipulating existing graphics, as well as in producing their own graphics.

**General Outcomes:** *The student will:*

- demonstrate the basic elements and principles of design, by using computer software graphics tools to:
  - duplicate graphics designs
  - create graphics layouts
- demonstrate use of software functions
- apply, consistently, appropriate workstation routines
- demonstrate basic competencies.



## GENERAL OUTCOMES: INTERMEDIATE LEVEL

### COURSE INF2060: ELECTRONIC PUBLISHING 1

**Level:** Intermediate

**Theme:** Productivity Software

**Prerequisite:** INF1030 Word Processing 1

**Description:** Students develop skill, using electronic/desktop publishing software to create a variety of camera-ready documents.

**General Outcomes:** *The student will:*

- demonstrate basic electronic publishing software competence, by using page make-up tools and commands to produce camera-ready publications
- apply, consistently, appropriate workstation routines
- demonstrate basic competencies.

### COURSE INF2130: MULTIMEDIA AUTHORIZING 1

**Level:** Intermediate

**Theme:** Productivity Software

**Prerequisite:** INF1070 Hypermedia Tools

**Description:** Students are introduced to multimedia software and provided with an opportunity to develop basic authoring competence, by accessing and integrating software resident text, video and audio clips.

**General Outcomes:** *The student will:*

- demonstrate multimedia authoring competence, by using software resident text, video and audio clips to:
  - use software-specific commands to access and manipulate text video and audio
  - develop a multimedia presentation
- apply, consistently, appropriate workstation routines
- demonstrate basic competencies.

**COURSE INF2200: INFORMATION HIGHWAY 2**

**Level:** Intermediate

**Theme:** Dynamic Environment

**Prerequisite:** None

**Description:** Students learn how to produce a web page for the Internet.

**General Outcomes:** *The student will:*

- research characteristics of an effective web page
- design, create and present a web page
- enhance web page to improve features and functions
- apply, consistently, appropriate workstation routines
- demonstrate basic competencies.



## GENERAL OUTCOMES: ADVANCED LEVEL

### COURSE INF3070: ELECTRONIC PUBLISHING 2

**Level:** Advanced

**Theme:** Productivity Software

**Prerequisite:** INF2060 Electronic Publishing 1

**Description:** Students use the functions and commands of electronic/desktop publishing software as they integrate text composing, editing, typesetting, graphics generation and page layout functions to create customized, professional, quality documents.

**General Outcomes:** *The student will:*

- demonstrate electronic publishing software competence, by:
  - creating a customized document effectively incorporating text and graphics to communicate an idea or activity
  - applying software make-up tools and commands
- apply, consistently, appropriate workstation routines
- demonstrate basic competencies.

### COURSE INF3130: MULTIMEDIA AUTHORIZING 2

**Level:** Advanced

**Theme:** Productivity Software

**Prerequisite:** INF2130 Multimedia Authoring 1

**Description:** Students learn to use a multimedia file or multimedia authoring software based on digitized input of text, video and audio clips.

**General Outcomes:** *The student will:*

- demonstrate multimedia authoring software and digitized input competence, by:
  - capturing text/images, video and audio information from external sources, and inputting it on a computer
  - using captured text/images, video and audio to create a multimedia presentation
- apply, consistently, appropriate workstation routines
- demonstrate basic competencies.

## **COURSE INF3190: INFORMATION HIGHWAY 3**

**Level:** Advanced

**Theme:** Dynamic Environment

**Prerequisite:** INF2200 Information Highway 2

**Description:** Students develop and maintain an Internet/intranet web site that makes use of advanced features.

**General Outcomes:** *The student will:*

- develop a multipage web site to be placed on the Internet or a local intranet
- present and describe to a group, the advanced features of a web site
- maintain and enhance a web site to improve features and functions
- apply, consistently, appropriate workstation routines
- demonstrate basic competencies.

## **COURSE INF3200: INTERNET SERVICES**

**Level:** Advanced

**Theme:** Dynamic Environment

**Prerequisite:** INF2200 Information Highway 2

**Description:** Students expand their skills from INF2200 Information Highway 2, by learning how to operate, maintain and build an Internet/intranet site that may include computer bulletin boards, forums, electronic mail, Internet list servers, and/or moderated newsgroups. Proper use of hardware, software and liaison with users and clients is emphasized.

**General Outcomes:** *The student will:*

- demonstrate competencies to access information from existing electronic messaging systems
- design and create an electronic messaging system
- maintain and enhance an electronic messaging system
- apply, consistently, appropriate workstation routines
- demonstrate basic competencies.

# CAREER AND TECHNOLOGY STUDIES

## PROGRAM PHILOSOPHY AND RATIONALE

### VISION

To engage students in learning opportunities through which they discover their interests in practical and purposeful ways.

### INTRODUCTION

Canadian society experiences continuous social, cultural and economic change, and today's students must be confident in their ability to respond to change and successfully meet the challenges they face. Whether students enter the work force or continue their education after senior high school, they will be challenged by increased independence and responsibility as they pursue choices and opportunities in their life paths.

Current trends indicate that the majority of new jobs today and in the future will require some form of post-secondary education and that the completion of senior high school will no longer be sufficient. Alberta faces a range of emerging challenges, including the changing nature of work and career paths; the requirement of greater skills and knowledge in many occupations; the introduction of new technologies; changing patterns of education and training; the globalization of the marketplace; labour shortages; and the need for highly skilled, educated and innovative people.

The Career and Technology Studies (CTS) program has been revised and refocused in cooperation with teachers, business and industry representatives, and post-secondary educators to address the emerging trends, challenges and opportunities of today and tomorrow. The result is:

- a focused program of studies based on credible occupational areas
- opportunities for all students to explore their abilities, interests and passions and to develop knowledge, skills and attitudes through exploratory courses or a pathways model
- printed and digital resources that support learning experiences in career fields
- access to CTS programming through classroom, online, off-campus and other combined approaches to instruction.

### PHILOSOPHY

The CTS program is designed to develop skills that senior high school students can apply in their daily lives when preparing for entry into the workplace or for further learning opportunities. Through the CTS program, students are provided with opportunities to personalize their learning, identify and explore their interests, manage transitions and build partnerships while developing basic competencies, that is, the attitudes and behaviours that people need to participate and progress in today's dynamic world of work.



Today's world of work demands that individuals are able to navigate and build their own career paths while adapting to continual change. This expectation requires a shift in the language used to define "career" as well as a shift in the delivery of career development. Careers are not defined as jobs and occupations, but rather as whole packages of expressed roles, knowledge, choices, passions and experiences. Careers are created by individuals who act upon passions, interests, abilities and other internal factors and combine them with external options and circumstances. Each person's career path is unique, even though individuals may share common credentials, occupations, work roles, or jobs and experiences.

Ultimately, it is the student who will make his or her own links between school, career development and post-secondary options. Career development requires students to be active in their learning and to develop enthusiasm for lifelong learning that carries them beyond learning in school.

Career development also requires acknowledgement that today's world is a technological world. Technology affects the environment, one's standard of living and one's quality of life. People use technology in the workplace, at home, at school and in sporting and leisure activities. Technology is used to extend possibilities, allowing individuals to intervene in the world through the development of products, systems and environments. Technology is continually changing. It is influenced by and, in turn, influences the cultural, ethical, environmental, political and economic factors of the day, both local and global.

Students in CTS can develop competence and confidence in understanding and using existing technologies and in creating solutions to technological problems. Taking CTS courses contributes to the intellectual and practical development of students, as individuals and as informed members of a technological society.

The CTS program strives to address career development in a way that emphasizes personalized learning, relevance, transitions and partnerships. It does so by:

- providing opportunities for all students to explore their abilities, interests and passions and to develop knowledge, skills and attitudes so they can be fulfilled, productive citizens
- providing opportunities for all students to develop the foundations to manage transitions within their learning environment and when moving into further education, training and/or the workplace
- influencing the growth of a career development culture in schools and communities
- facilitating the integration and coordination of career development across Kindergarten to Grade 12, advanced education, workplaces and the community.

*Students' interests might lie in working with their hands, working with other people, working in an environment of constantly changing ideas, or working in a career that follows carefully established patterns. All of these areas include a variety of occupations that require more or less education.<sup>1</sup>*

## RATIONALE

CTS courses enable students to make reasoned and effective career decisions and target efforts to meet their goals. Students will have opportunities to expand their knowledge about careers, occupations and job opportunities, as well as the education and/or training requirements involved. Competencies achieved by mastering CTS course outcomes will allow students to make relevant connections with work and/or post-secondary training.

CTS also enables students to develop the confidence they need as they move into adult roles by allowing them to assume increased responsibility for their learning; cultivate their individual talents, interests and abilities; and define and act on their goals. The CTS pathways model includes the following benefits for students, educators and employers.

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1. "From the Mouths of Middle-Schoolers: Important Changes for High School and College." *Phi Delta Kappan*, Vol. 89, No. 03 (November 2007): 189–193. William J. Bushaw. Reprinted with permission of PDK International.



## **Benefits for Students**

Through the pathways model, students experience:

- relevant and engaged learning
- freedom in exploring multiple pathways
- personally meaningful pathways leading to specialized skills
- engagement in their interests or passions
- opportunities to achieve post-secondary credentials while still in senior high school
- easier transitions from senior high school to post-secondary education or the work force.

## **Benefits for Educators**

Through the pathways model, educators experience:

- more focused organization of CTS courses
- a focused and engaged learner
- greater opportunity for community support.

## **Benefits for Employers**

Through the pathways model, employers experience:

- employees with specialized skills or post-secondary or industry credentials
- motivated and engaged employees.

# PROGRAM ORGANIZATION

## OVERVIEW



The CTS Compass above can assist students as they explore and discover their interests and passions.

As students move into the Middle Years, they begin to identify with one or more interest areas: business, communication, resources, technology and/or human service. As students enter senior high school and the CTS program, they begin to identify the occupational cluster or clusters that suit their interests and abilities. As students become more focused, they examine options for occupations based on the National Occupational Classification. With a career goal in mind, students can develop a pathway that leads them directly to an occupation or to post-secondary education.

The organization of the CTS program into clusters provides students, teachers and administrators with opportunities to create exploratory programs, in which students can sample courses of interest, or to use or create focused pathways that lead to specialized skills, external credentials or further education. Career guidance professionals may use this organizational structure to assist students in assessing their educational goals, interests, abilities and skills and to facilitate good matches to the many pathway options possible in the CTS clusters.

## CTS COURSES

CTS courses are competency-based instructional units defined by learning outcomes that identify what a student is expected to know and be able to do. Courses include outcomes with practical applications, and each course represents approximately 25 hours of access to instruction. CTS courses are weighted at 1 credit each and are divided into three levels of achievement: introductory, intermediate and advanced. Some courses require one or more prerequisites, which are essential for maintaining safety standards, appropriate instructional sequence and articulation with post-secondary programs. CTS courses can be selected by students in an exploratory fashion, or they can be taken as part of an intentional pathway.

For each course, the program of studies lists a general description, the general and specific outcomes, prerequisites and course parameters (e.g., recommendations regarding instructional qualifications, facilities and equipment). The general outcomes are presented in boldface, and the specific outcomes follow immediately in lightface.

### Levels of Achievement

Courses are organized into three levels of achievement: **introductory**, **intermediate** and **advanced**. Levels of achievement are not indicators of grade levels. As students progress through the levels, they will be expected to meet higher standards and to demonstrate an increased degree of competence in both the general and specific outcomes.

**Introductory** level courses help students build daily living skills and form the basis for further learning. Introductory courses prepare students for further experiences in the cluster, pathway or occupational area.

**Intermediate** level courses build on the competencies developed at the introductory level. They provide a broader perspective, helping students recognize the wide range of related career opportunities available within the cluster.

**Advanced** level courses refine expertise and help prepare students for entry into the workplace or a related post-secondary program defined within the cluster.

## CTS CLUSTERS

A cluster is a group of CTS courses that represents occupations and broad industry commonalities. Clusters in CTS are aligned with the National Occupational Classification (NOC) and function as an organizing tool for the CTS program. (For more information on the NOC, visit the Human Resources and Skills Development Canada Web site at <http://www5.hrsdc.gc.ca/NOC-CNP/app/AboutNOC.aspx?lc=E.>)

The CTS program includes five clusters: Business, Administration, Finance & Information Technology (BIT); Health, Recreation & Human Services (HRH); Media, Design & Communication Arts (MDC); Natural Resources (NAT); and Trades, Manufacturing & Transportation (TMT).

Clusters connect learning outcomes specific to the knowledge, skills and attitudes required for related occupational areas. Clusters:

- help students choose curriculum and occupational fields for which they have interest and aptitude
- provide a context for selecting courses specific to a pathway
- help connect students with exploratory courses of study, allowing students to gain general, transferable skills
- help students develop specialized skills and knowledge through pathways
- focus teaching and learning by relating similar knowledge, linking shared skills, guiding career exploration, allowing students to make informed career choices, associating common interests and linking education with relevant real-world experiential activities.

## The Five Clusters

### **Business, Administration, Finance & Information Technology (BIT)**

The focus of the BIT cluster is for students to develop and apply important knowledge, skills and attitudes so they can implement efficient systems and strategies of management and marketing and use electronic technologies to collect, structure, manipulate, retrieve and communicate information within individual, family, workplace, community and global contexts.

### **Health, Recreation & Human Services (HRH)**

The focus of the HRH cluster is for students to develop and apply important knowledge, skills and attitudes so they can provide care and services for individuals and groups in a variety of industries, such as health care, recreation, cosmetology, the food industry and the legal system.

### **Media, Design & Communication Arts (MDC)**

The focus of the MDC cluster is for students to develop and apply important knowledge, skills and attitudes so they can provide well designed and aesthetically effective communication solutions.

### **Natural Resources (NAT)**

The focus of the NAT cluster is for students to develop and apply the knowledge, skills and attitudes to work individually and collectively, as private citizens and as members of the work force, toward the conservation and responsible use of energy and natural resources.

### **Trades, Manufacturing & Transportation (TMT)**

The focus of the TMT cluster is for students to develop and apply important knowledge, skills and attitudes relative to the manufacture and assembly of products from individual components and the processing of raw materials into products.



## CTS PATHWAYS

Many schools in North America and around the world are now providing students with opportunities to explore their career path through a variety of courses that are organized around common occupational areas. These pathways allow students to follow their natural skills, aptitudes and interests in an organized and progressive way as they work toward goals that may include university, college, apprenticeship training or moving directly into the work force.

Pathways are flexible and they permit students to:

- explore an occupation or an interest area
- gain an occupational or a specialized skill set required in the workplace
- apply relevant learning from academic courses to real-life situations
- focus their senior high school course plans into a career path.

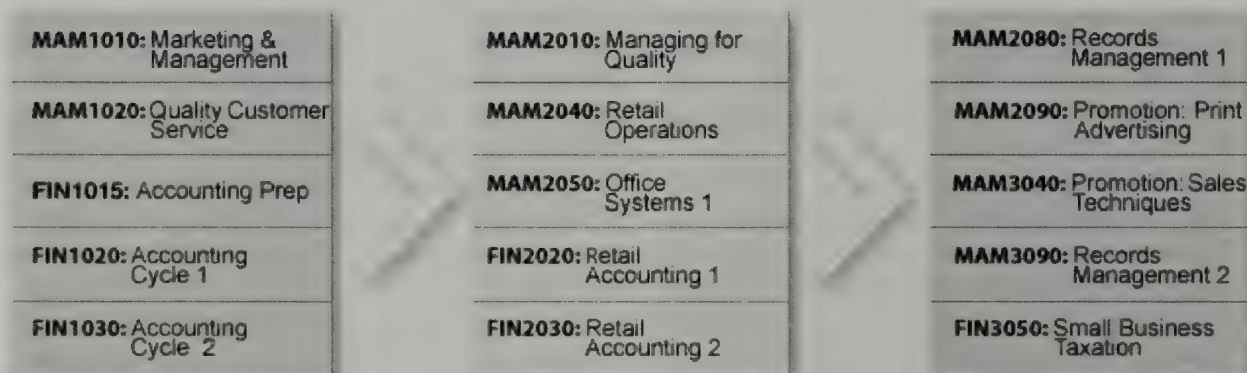
The pathways model of CTS facilitates making connections between CTS courses and other subjects. Within each CTS cluster, the potential for several pathways exists. These pathways will address the specific skills and knowledge necessary to pursue a full range of career opportunities, including technical and professional career specialties. All pathways, with the exception of credentialed pathways (see the text in the right-hand column), can be built and modified by students or teachers.

Pathways should be designed to prepare students to transition successfully from senior high school to post-secondary education or to employment in an occupational area. Links to post-secondary educational institutions, employers, industry groups and other stakeholders can be included within a pathway.

There are two possible kinds of pathways in the CTS program:

1. **Specialized skill pathways** provide students with the knowledge, skills and attitudes for employment or further education. These pathways can be customized to meet student, school or community program needs. Courses within such a pathway will prepare students for specific community or job-site skills.
2. **Credentialed pathways** provide students with post-secondary and/or business and industry credentials or articulation. For students to obtain the desired credential or articulation, all specified course outcomes within the pathway must be met.

### SAMPLE PATHWAY (BIT): BUSINESS BASICS



**Note:** A variety of sample pathways are provided in the *Guide to Career and Technology Studies*.



## **MEETING THE DIVERSE NEEDS OF ALBERTA'S STUDENTS**

Alberta schools include students from a rich variety of backgrounds. These students have a wide range of abilities and needs. Like all school programs, the CTS program has been developed with this diversity in mind. Teachers and instructors should be aware of the individual needs of their students and adapt their instruction and programming accordingly.

### **First Nations, Métis and Inuit (FNMI) Students**

FNMI students in northern and western Canada come from diverse geographic areas with varied cultural and linguistic backgrounds. Teachers and instructors need to understand the diversity of these students' cultures and experiences. They also need to understand that there are values and cultural traditions shared amongst many Aboriginal Canadians, including the importance of family and the role of Elders in guiding and supporting young people.

FNMI students often have a holistic view of learning—they look for connections through experiential learning. Such connections can be made within the real-world, experiential CTS program. Traditionally, in FNMI cultures, little emphasis was placed upon the written word. Still today, oral communication and practical applications and experiences are important to student learning and understanding. A variety of teaching and assessment strategies can help build upon the diverse knowledge, cultures, communication styles, skills, attitudes, experiences and learning styles of FNMI students.

### **English as a Second Language or French as a Second Language Students**

Immigrants to Alberta come from many different cultural and linguistic backgrounds. Many of these new arrivals become students in Alberta schools, yet their knowledge of English or French may be minimal. Some students who have lived in Canada their entire lives may also be learning to speak English or French as a second (or third) language. The variety of teaching and assessment strategies that can be used in the CTS program may help

build upon the diverse knowledge, cultures, communication styles, skills, attitudes, experiences and learning styles of these students.

### **Students Who Have an Individualized Program Plan (IPP)**

Students who have been identified as having special education needs will have an Individualized Program Plan (IPP), which should be used to guide teachers' planning and instruction. The needs of these students vary greatly from one individual to the next and may range from physical adaptations to the environment or equipment, to arranging for special testing accommodations.

## CLUSTER COURSES

<b>Business, Administration, Finance &amp; Information Technology (BIT) Courses</b>		
<b>Introductory Level</b>	<b>Intermediate Level</b>	<b>Advanced Level</b>
<b>Computing Science</b>		
CSE1010: Computer Science 1	CSE2010: Computer Science 2	CSE3010: Computer Science 3
CSE1110: Structured Programming 1	CSE2110: Procedural Programming 1	CSE3020: Computer Science 4
CSE1120: Structured Programming 2	CSE2120: Data Structures 1	CSE3110: Iterative Algorithm 1
CSE1210: Client-side Scripting 1	CSE2130: Files & File Structures 1	CSE3120: Object-oriented Programming 1
CSE1220: Client-side Scripting 2	CSE2140: Second Language Programming 1	CSE3130: Object-oriented Programming 2
CSE1240: Robotics Programming 1	CSE2210: Client-side Scripting 3	CSE3140: Second Language Programming 2
CSE1910: CSE Project A	CSE2240: Robotics Programming 2	CSE3210: Server-side Scripting 1
	CSE2910: CSE Project B	CSE3240: Robotics Programming 3
	CSE2920: CSE Project C	CSE3310: Recursive Algorithms 1
		CSE3320: Dynamic Data Structures 1
		CSE3330: Dynamic Data Structures 2
		CSE3340: Dynamic Data Structures 3
		CSE3910: CSE Project D
		CSE3920: CSE Project E
<b>Enterprise and Innovation</b>		
ENT1010: Challenge & Opportunity	ENT2010: Analyzing Ventures	ENT3010: Managing the Venture
ENT1020: Elements of a Venture Plan	ENT2020: Financing Ventures	ENT3020: Expanding the Venture
ENT1910: ENT Project A	ENT2030: Marketing the Venture	ENT3910: ENT Project D
	ENT2040: Create the Venture	ENT3920: ENT Project E
	ENT2910: ENT Project B	
	ENT2920: ENT Project C	
<b>Financial Management</b>		
FIN1010: Personal Financial Information	FIN2020: Retail Accounting 1	FIN3010: Advanced Accounting
FIN1015: Accounting Prep	FIN2030: Retail Accounting 2	FIN3020: Management Accounting
FIN1020: Accounting Cycle 1	FIN2040: Accounting Software	FIN3030: Capital Accounting
FIN1030: Accounting Cycle 2	FIN2060: Personal Taxation	FIN3040: Financial Statements
FIN1910: FIN Project A	FIN2070: Payroll Accounting	FIN3050: Small Business Taxation
	FIN2910: FIN Project B	FIN3060: Financial Analysis
	FIN2920: FIN Project C	FIN3070: Financial Planning
		FIN3080: Personal Investment Planning 1
		FIN3090: Personal Investment Planning 2
		FIN3910: FIN Project D
		FIN3920: FIN Project E
<b>Information Processing</b>		
INF1030: Word Processing 1	INF2020: Keyboarding	INF3010: Hardware & Software Analysis
INF1050: Database 1	INF2050: Word Processing 2	INF3060: Word Processing 3
INF1060: Spreadsheet 1	INF2070: Database 2	INF3080: Project Management Tools
INF1070: Digital Presentation	INF2080: Spreadsheet 2	INF3095: Productivity Software Integration
INF1910: INF Project A	INF2090: Correspondence	INF3910: INF Project D
	INF2100: Reports	INF3920: INF Project E
	INF2910: INF Project B	
	INF2920: INF Project C	

**Management and Marketing**

MAM1010: Marketing & Management	MAM2010: Managing for Quality	MAM3010: The Business Organization
MAM1020: Quality Customer Service	MAM2030: Visual Merchandising	MAM3020: Business in the Canadian Economy
MAM1030: Communication Strategies 1	MAM2040: Retail Operations	MAM3030: Business in the Global Marketplace
MAM1040: E-commerce 1	MAM2050: Office Systems 1	MAM3040: Promotion: Sales Techniques
MAM1050: Agriculture Consumer Products & Services	MAM2060: Communication Strategies 2	MAM3050: Distributing Goods & Services
MAM1910: MAM Project A	MAM2080: Records Management 1	MAM3060: Setting Up a Retail Store
	MAM2090: Promotion: Print Advertising	MAM3070: Office Systems 2
	MAM2110: E-commerce 2	MAM3080: Communication Strategies 3
	MAM2130: Energy & Resources Supply & Distribution	MAM3090: Records Management 2
	MAM2910: MAM Project B	MAM3100: Promotion: Broadcast Advertising
	MAM2920: MAM Project C	MAM3120: E-commerce 3
		MAM3130: Agriculture Marketing
		MAM3140: Energy & Resources Market Basics & Trends
		MAM3150: The Forest Marketplace
		MAM3910: MAM Project D
		MAM3920: MAM Project E

**Networking**

NET1010: Digital Technology 1	NET2010: Digital Technology 2	NET3010: Digital Technology 3
NET1910: NET Project A	NET2020: Workstation Technology & Operations	NET3020: Digital Applications
	NET2030: Network Structures	NET3030: Microprocessors
	NET2040: Network Media & Devices	NET3040: Microprocessor Interface
	NET2050: Open System Interconnection	NET3050: Network Operating Systems
	NET2060: Network Protocols	NET3060: Wide Area Networks
	NET2070: Local Area Networks	NET3070: Routing Fundamentals
	NET2080: Laptops & Peripherals	NET3080: Internet Processes
	NET2110: Telecommunications 1	NET3090: Network Management
	NET2910: NET Project B	NET3100: Network Media & Devices, Security
	NET2920: NET Project C	NET3110: Telecommunications 2
		NET3910: NET Project D
		NET3920: NET Project E



## Trades, Manufacturing & Transportation (TMT) Courses

Introductory Level	Intermediate Level	Advanced Level
<b>Construction</b>		
CON1010: Construction Tools & Materials	CON2010: Site Preparation	CON3010: Concrete Work (Structures & Finishes)
CON1070: Building Construction	CON2020: Concrete Forming	CON3020: Masonry Work (Structures & Finishes)
CON1120: Product Management	CON2030: Alternative Foundations	CON3030: Wall & Ceiling Finishing
CON1130: Solid Stock Construction	CON2035: Floor Framing Systems	CON3040: Stair Construction
CON1140: Turning Operations	CON2045: Wall Framing Systems	CON3050: Roof Structures 2 (Framing & Covering)
CON1160: Manufactured Materials	CON2050: Roof Structures 1 (Framing & Finishing)	CON3060: Doors & Trim
CON1180: Mould Making & Casting	CON2060: Exterior Finishing (Door, Window & Siding)	CON3070: Floorcovering
CON1910: CON Project A	CON2070: Electrical Systems	CON3080: Energy-efficient Housing
	CON2080: Plumbing Systems	CON3090: Renovations/Restorations
	CON2090: Climate Control Systems	CON3105: Commercial Structures
	CON2100: Agri-structures	CON3110: Site Management
	CON2120: Multiple Materials	CON3120: Tool Maintenance
	CON2130: Furniture Making 1 (Box Construction)	CON3130: Furniture Making 3 (Leg & Rail)
	CON2140: Furniture Making 2 (Frame & Panel)	CON3140: Furniture Making 4 (Surface Enhancement)
	CON2150: Finishing & Refinishing	CON3150: Furniture Repair
	CON2160: Cabinetmaking 1 (Web & Face Frame)	CON3160: Cabinetmaking 3 (Cabinets/ Countertops)
	CON2170: Cabinetmaking 2 (Door & Drawer)	CON3170: Cabinetmaking 4 (Layout & Installation)
	CON2180: Wood Forming	CON3190: Production Planning
	CON2190: Manufacturing Systems	CON3200: Production Management
	CON2200: Product Development	CON3210: Framing Systems 2 (Floor, Wall & Ceiling)
	CON2910: CON Project B	CON3910: CON Project D
	CON2920: CON Project C	CON3920: CON Project E
		<u>Carpentry Apprenticeship</u>
		CRA3400: Introduction to Work Site Safety
		CRA3405: Basic Hand, Power Tools & Safety
		CRA3410: Construction Materials & Processes
		CRA3415: Site Preparation & Floor Systems
		CRA3420: Foundations & Concrete Structures
		CRA3425: Blueprint Drawings & Sketching
		CRA3430: Construction Machines, Tools & Equipment
		CRA3435: Blueprint Interpretation
		CRA3440: CRA Practicum Course A
		CRA3445: CRA Practicum Course B
		CRA3450: CRA Practicum Course C
		CRA3455: CRA Practicum Course D



**Electro-Technologies**

ELT1010: Electro-assembly 1	ELT2010: Electro-assembly 2	ELT3010: Electro-assembly 3
ELT1030: Conversion & Distribution	ELT2020: Electrical Servicing	ELT3020: Electronic Servicing
ELT1050: Electronic Power Supply 1	ELT2030: Branch Circuit Wiring	ELT3030: Power Systems & Services
ELT1080: Control Systems 1	ELT2050: Electronic Power Supply 2	ELT3040: Generation/Transformation
ELT1090: Analog Communication 1	ELT2080: Control Systems 2	ELT3110: Amplifiers
ELT1110: Security Systems 1	ELT2090: Analog Communication 2	ELT3140: Motors
ELT1130: Robotics 1	ELT2110: Security Systems 2	ELT3150: Robotics 3
ELT1140: Robotics Applications 1	ELT2120: Electro-optics	ELT3160: Control Applications
ELT1910: ELT Project A	ELT2130: Magnetic Control Devices	ELT3170: Robotics Microprocessors
	ELT2140: Robotics 2	ELT3180: Robotics Vision Systems
	ELT2150: Electronic Controls	ELT3190: Robotics Kinematics & Behaviour
	ELT2160: Robotics Sensor 1	ELT3200: Robotics Artificial Intelligence
	ELT2170: Robotics Sensor 2	ELT3205: Expert Systems
	ELT2180: Process Control	ELT3910: ELT Project D
	ELT2910: ELT Project B	ELT3920: ELT Project E
	ELT2920: ELT Project C	

<b>Fabrication</b>		
FAB1010: Fabrication Tools & Materials	FAB2010: Structural Engineering	FAB3010: Materials Testing
FAB1040: Oxyacetylene Welding	FAB2020: Print Reading	FAB3020: Metallurgy Fundamentals
FAB1048: Semi-automated/ Automated Welding	FAB2030: Oxyfuel Welding	FAB3030: Gas Tungsten Arc Welding
FAB1050: Basic Electric Welding	FAB2040: Thermal Cutting	FAB3040: Specialized Welding
FAB1090: Sheet Fabrication 1 (Hand Processes)	FAB2048: Flux Cored Arc Welding 1	FAB3048: Flux Cored Arc Welding 2
FAB1100: Fabrication Principles	FAB2050: Arc Welding 1	FAB3050: Arc Welding 3
FAB1110: Bar & Tubular Fabrication	FAB2060: Arc Welding 2	FAB3060: Arc Welding 4
FAB1120: Foundry 1 (One-piece Pattern)	FAB2070: Gas Metal Arc Welding 1	FAB3070: Pipe & Tubular Welding
FAB1130: Principles of Machining	FAB2090: Sheet Fabrication 2 (Machine Processes)	FAB3080: Automated Welding
FAB1160: Production Systems	FAB2100: Sheet Fabrication 3 (Parallel Line)	FAB3090: Sheet Fabrication 4 (Radial Line)
FAB1910: FAB Project A	FAB2110: Forging Fundamentals	FAB3110: Sheet Fabrication 5 (Duct Components)
	FAB2120: Foundry 2 (Split Pattern)	FAB3120: Foundry 3 (Core Moulding)
	FAB2130: Precision Turning 1	FAB3130: Precision Turning 2
	FAB2140: Precision Milling 1	FAB3140: Precision Milling 2
	FAB2150: CNC Turning (Computer Numerical Control)	FAB3150: CNC Milling (Computer Numerical Control)
	FAB2160: Custom Fabrication	FAB3160: Prefabrication Principles
	FAB2170: Pipe Fitting	FAB3170: Gas Metal Arc Welding 2
	FAB2910: FAB Project B	FAB3910: FAB Project D
	FAB2920: FAB Project C	FAB3920: FAB Project E
		<u>Welding Apprenticeship</u>
		WDA3400: Fabrication Orientation & Safety
		WDA3405: Fabrication Tools & Weld Faults
		WDA3410: Oxyfuel Welding
		WDA3415: Gas Metal Arc Welding
		WDA3420: Flux Cored Arc Welding & Submerged Arc Welding
		WDA3425: Materials Handling
		WDA3430: Shielded Metal Arc Welding (Part 1)
		WDA3435: Shielded Metal Arc Welding (Part 2)
		WDA3440: Shop/Lab Practices for GMAW, FCAW & SAW
		WDA3445: OAW Cutting Practical
		WDA3450: GMAW & FCAW Practical
		WDA3455: SMAW Practical
		WDA3460: WDA Practicum Course A
<b>Logistics</b>		
LOG1010: Logistics	LOG2010: Warehouse & Distribute 2	LOG3010: Warehouse & Distribute 3
LOG1020: Warehouse & Distribute 1	LOG2020: Traffic & Transport 2	LOG3020: Traffic & Transport 3
LOG1030: Traffic & Transport 1	LOG2030: Purchasing 2	LOG3030: Purchasing 3
LOG1040: Purchasing 1	LOG2040: Inventory Management 1	LOG3040: Inventory Management 2
LOG1910: LOG Project A	LOG2910: LOG Project B	LOG3910: LOG Project D
	LOG2920: LOG Project C	LOG3920: LOG Project E

## Mechanics

MEC1010: Modes & Mechanisms	MEC2010: Vehicle Detailing	MEC3010: Buying & Selling Vehicles
MEC1015: Mechanics Tools & Materials	MEC2020: Vehicle Maintenance	MEC3020: Vehicle Value Appraisal
MEC1020: Vehicle Service & Care	MEC2030: Lubrication & Cooling	MEC3030: Engine Diagnosis
MEC1040: Engine Fundamentals	MEC2040: Fuel & Exhaust Systems	MEC3040: Engine Tune-up
MEC1090: Electrical Fundamentals	MEC2050: Alternative Fuel Engines	MEC3050: Engine Replacement
MEC1110: Pneumatics & Hydraulics	MEC2060: Ignition Systems	MEC3060: Engine Reconditioning 1
MEC1130: Mechanical Systems	MEC2070: Emission Controls	MEC3070: Engine Reconditioning 2
MEC1150: Ride & Control Systems	MEC2090: Electrical Components	MEC3080: Alternative Energy Systems
MEC1160: Structures & Materials	MEC2100: Power Assist Accessories	MEC3090: Computer Systems
MEC1165: Mechanics Welding Fundamentals	MEC2110: Braking Systems	MEC3100: Safety Systems
MEC1170: Metal Forming & Finishing	MEC2120: Hydraulic Accessories	MEC3110: Climate Control
MEC1190: Surface Preparation 1	MEC2130: Drive Line	MEC3120: Power Assisting
MEC1910: MEC Project A	MEC2140: Transmissions/ Transaxles	MEC3130: Automatic Transmissions
	MEC2150: Suspension Systems	MEC3140: Drive Train Repair
	MEC2160: Steering Systems	MEC3150: Wheel Alignment
	MEC2170: Metal Repair & Finishing	MEC3160: Body Repair Estimation
	MEC2180: Trim Replacement	MEC3170: Damage Analysis
	MEC2190: Surface Preparation 2	MEC3180: Damage Repair 1
	MEC2200: Refinishing 1	MEC3190: Damage Repair 2
	MEC2210: Touch-up & Finishing	MEC3200: Refinishing 2
	MEC2220: Interior Repairs	MEC3210: Plastic & Fibreglass
	MEC2910: MEC Project B	MEC3220: Glass Replacement
	MEC2920: MEC Project C	MEC3230: Refinishing 3
		MEC3910: MEC Project D
		MEC3920: MEC Project E

### Auto Service Technician Apprenticeship

ASA3400: Basic Tools & Materials

ASA3405: Electrical Fundamentals

ASA3410: Electrical Circuits & Diagnosis

ASA3415: Frames, Suspension & Steering Linkages

ASA3420: Manual & Power Steering Systems

ASA3425: Steering Angles, Steering Columns & Restraint Systems

ASA3430: Wheel Alignment Procedures

ASA3435: Braking Systems I

ASA3440: Braking Systems II

ASA3445: Braking Systems III

ASA3450: Drivelines & Introductory Welding

ASA3455: ASA Practicum Course A

ASA3460: ASA Practicum Course B

ASA3465: ASA Practicum Course C

ASA3470: ASA Practicum Course D





# **BUSINESS, ADMINISTRATION, FINANCE & INFORMATION TECHNOLOGY (BIT)**

The focus of the BIT cluster is for students to develop and apply important knowledge, skills and attitudes so they can implement efficient systems and strategies of management and marketing and use electronic technologies to collect, structure, manipulate, retrieve and communicate information within individual, family, workplace, community and global contexts.

## **Occupational Areas in the BIT Cluster**

- Computing Science
- Enterprise and Innovation
- Financial Management
- Information Processing
- Management and Marketing
- Networking



## COURSE CSE1010: COMPUTER SCIENCE 1

Level: Introductory

Prerequisite: None

<b>Description:</b>	Students explore hardware, software and processes. This includes an introduction to the algorithm as a problem-solving tool, to programming languages in general and to the role of programming as a tool for implementing algorithms.
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**Parameters:** Access to an appropriate computer work station, the Internet, a programming language/environment and associated support materials. It is recommended that the course be taught in tandem with one or more programming courses.

**Supporting Courses:** CSE1110: Structured Programming 1  
CSE1120: Structured Programming 2, and/or any  
Intermediate project course involving imperative programming

<b>Outcomes:</b>	<b>The student will:</b>
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**1. identify and describe the nature, approaches and areas of interest of computer science**

- 1.1 define and describe computer science with consideration of:
  - 1.1.1 the main goal of the discipline
  - 1.1.2 the use of algorithms
  - 1.1.3 computer systems used to test and/or implement algorithms
  - 1.1.4 the translation of algorithms through programming
- 1.2 describe the general areas of interest of computer science including:
  - 1.2.1 the theory of computation
  - 1.2.2 algorithms and data structures
  - 1.2.3 programming methodology and languages
  - 1.2.4 computer elements and architecture
  - 1.2.5 human-machine and machine-machine interfacing
  - 1.2.6 automata
  - 1.2.7 artificial intelligence
  - 1.2.8 visual and auditory rendering
  - 1.2.9 general development of information technology applications
- 1.3 compare and contrast computer science, computer engineering and information technology; e.g., theoretical versus applied, general versus specific, exploratory versus applicatory
- 1.4 describe some of the misconceptions associated with computer science; e.g., synonymous with programming, reliant on solitary individuals for the bulk of its advances, relatively little real-world contact, the learning of various computer applications
- 1.5 computer science's role in an information society

**2. demonstrate an understanding of the nature, design and use of basic algorithms associated with problems involving the sequential inputting, processing and outputting of data**

- 2.1 define algorithms and explain how they are used
- 2.2 compare and contrast the “iterative and incremental” and “waterfall” models of software development

- 2.3 demonstrate the analysis and design stages of a Systems Development Life Cycle model using appropriate tools; e.g., flowcharts, pseudocode, input/processing/output (IPO) charting
- 2.4 demonstrate a number of core algorithms including:
  - 2.4.1 accumulation (keeping a running total)
  - 2.4.2 determining the mean
  - 2.4.3 determining minimums and maximums
- 3. explain and demonstrate the nature of structured programming**
  - 3.1 consider the rationale for structured programming
  - 3.2 consider GOTO-less programming
  - 3.3 consider three fundamental control structures—sequential, decision and iterative
- 4. explain and demonstrate an understanding of the nature, evolution, types and role of programming languages**
  - 4.1 describe how various programming languages have dealt with data representation; e.g., binary and hexadecimal systems, standard data types, data storage
  - 4.2 describe the nature of programming language, specifically that these languages:
    - 4.2.1 reflect a simplified version of natural language
    - 4.2.2 evolved in tandem with algorithms and hardware over a number of generations
    - 4.2.3 reflect the IPO data processing paradigm
  - 4.3 describe and demonstrate how programming languages are used in the coding stage of a Systems Development Life Cycle model by converting a representative set of algorithms into executable code
- 5. explain the nature, evolution and basic architecture of a von Neumann computer system**
  - 5.1 create a block diagram of a stereotypical von Neumann machine
  - 5.2 describe a number of typical devices associated with each block
  - 5.3 show the flow of data through the computer under the direction of a program
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 7.2 create a connection between a personal inventory and occupational choices



**COURSE CSE1110:      STRUCTURED PROGRAMMING 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students are introduced to a general programming environment in which they write simple structured algorithms and programs that input, process and output data, use some of the more basic operators and data types, and follow a sequential flow of control.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials. Specifically, students must have access to a programming environment that encourages structured programming.

Supporting Course: CSE1010: Computer Science 1

<b>Outcomes:</b>	<b>The student will:</b>
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- 1. demonstrate introductory structured programming skills by writing sequential algorithms to solve problems involving input, processing and output**
  - 1.1 describe the purpose and nature of an algorithm
  - 1.2 analyze a variety of simple algorithms and describe the task or tasks the algorithms are attempting to carry out
  - 1.3 analyze problems and determine if they can be solved using algorithms that employ an input/processing/output (IPO) approach
  - 1.4 decompose the problem into its input, processing and output components, and identify what data is already available to the program and what must be inputted
  - 1.5 sequence components appropriately so that processing occurs only when all required data is available and output occurs only after appropriate processing has occurred
  - 1.6 write the algorithm in an acceptable format; e.g., pseudocode, structured chart
  - 1.7 test the algorithm for failure as well as success with appropriate data
  - 1.8 revise the algorithm, as required
- 2. translate algorithms into source code, convert the source code into machine executable form, execute and debug, as required**
  - 2.1 describe a typical programming development environment commenting on the role of the key components; e.g., the source code editor, code translator (compiler and/or interpreter), executor, debugger
  - 2.2 compare and contrast integrated development environments specifically developed for programming with user assembled collections of applications and system software; e.g., text processor for coding, command line compiler
  - 2.3 describe and demonstrate the use of key components in a programming development environment
  - 2.4 convert algorithms into a sequence of statements in an appropriate programming language being sure to:
    - 2.4.1 maintain the IPO structure of the algorithm
    - 2.4.2 use appropriate internal and external documentation
    - 2.4.3 use appropriate data types such as integers, real numbers, characters and strings
    - 2.4.4 use appropriate variables and constants to hold data

- 2.4.5 use literals and input commands, e.g., methods or operators, to provide data for processing
- 2.4.6 use assignment, arithmetical and concatenation and interpolation operators, where appropriate, to process data
- 2.4.7 use output commands; e.g., methods or operators, to display processed data
- 2.5 test the algorithm for failure or success with appropriate data
- 2.6 revise the algorithm, as required
- 3. analyze and compare the results of the program with the intent of the algorithm and modify as required**
  - 3.1 use appropriate test data and debugging techniques to track and correct errors including:
    - 3.1.1 run-time errors; e.g., compiler, linker, syntax
    - 3.1.2 logic errors
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE CSE1120:     STRUCTURED PROGRAMMING 2**

**Level:**                   Introductory

**Prerequisite:**           CSE1110: Structured Programming 1

**Description:**           Students work with structured programming constructs by adding the selection and iteration program control flow mechanisms to their programming repertoire. They write structured algorithms and programs that use blocks to introduce an element of modularity into their programming practice.

**Parameters:**           Access to appropriate computer equipment, software, to the Internet and support materials. Specifically, students must have access to a programming environment that encourages structured programming.

**Supporting Courses:**    CSE1010: Computer Science 1, or any  
Intermediate project course involving imperative programming

**Outcomes:**            The student will:

- 1. demonstrate basic structured programming skills by writing algorithms to solve problems involving selection (decision making) and iteration (repetition)**
  - 1.1 analyze a problem and determine if it can be solved using an algorithm that employs an input/processing/output (IPO) approach
  - 1.2 determine if there is more than one IPO module present
  - 1.3 decompose the problem into its respective modules and identify the IPO components of each module
  - 1.4 identify what data is already available to the programmer and what must be inputted by the end user and organize into appropriate block or blocks using the appropriate program control structures
  - 1.5 identify the processing requirements and organize into appropriate blocks using the appropriate program control structures
  - 1.6 incorporate basic algorithmic idioms as required; e.g., accumulation, determining maximum or minimum values
  - 1.7 identify the output requirements and organize into appropriate blocks using the appropriate program control structures
  - 1.8 order components into an appropriate sequence where processing occurs only when all required data for a module is available and output occurs only after appropriate processing has occurred
  - 1.9 write the algorithm in an acceptable format; e.g., pseudocode, a structured chart
- 2. translate algorithms into source code, convert the source code into machine executable form, execute and debug, as required**
  - 2.1 maintain the IPO structure of the algorithm
  - 2.2 use appropriate internal and external documentation
  - 2.3 use appropriate basic (primitive) data types such as integers, real numbers, characters, strings, and Boolean values
  - 2.4 use appropriate variables and constants to hold data
  - 2.5 use literals and input commands, e.g., methods or operators, to provide data for processing

- 2.6 use assignment, arithmetical, relational, Boolean, and concatenation and interpolation operators, where appropriate, to process data
- 2.7 use basic processing idioms as required; e.g., accumulation, determining maximum or minimum values
- 2.8 use appropriate selection and iteration structures to avoid unconditional branching or exiting from the interior of a block including:
  - 2.8.1 nested conditional blocks
  - 2.8.2 nested iterative blocks
- 2.9 use output commands, e.g., methods or operators, to display processed data in an appropriately formatted form
- 3. analyze and compare the results of the program with the intent of the algorithm and modify, as required**
  - 3.1 use appropriate test data and debugging techniques to track and correct errors including:
    - 3.1.1 run-time errors; e.g., compiler, linker, syntax
    - 3.1.2 logic errors
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices



## **COURSE CSE1210: CLIENT-SIDE SCRIPTING 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students are introduced to Internet computing through the use of one or more Web-specific markup languages. As part of this process, students learn how the Web uses markup languages to provide a client-side approach to display static information. Students also learn how to analyze, modify, write and debug algorithms and documents that use a markup language.

**Parameters:** Access to appropriate computer equipment, software, support materials and the Internet. More specifically, students must have the tools they will require to design, write and debug markup language-based hypermedia documents.

**Supporting Courses:** CSE1010: Computer Science 1  
CSE1110: Structured Programming 1

**Outcomes:** The student will:

### **1. demonstrate an understanding of the general architecture of the Internet as it pertains to client-side scripting**

- 1.1 explain and demonstrate the client/server nature of the Internet including:
  - 1.1.1 describe the internetworked nature of the Internet
  - 1.1.2 illustrate the client/server relationship that exists among the work stations, stub networks, mid-level networks, regional networks and the backbone that makes up the Internet
  - 1.1.3 describe and illustrate how servers, routers, switches, work stations and other hardware components are used to provide the physical matrix required for client/server relationships
  - 1.1.4 describe and illustrate the Internet Protocol Suite (TCP/IP) model of networking, in general terms, outlining how this protocol provides the data transfer mechanism required to establish client/server relationships
  - 1.1.5 illustrate the client/server relationships set up when a user makes a request for an Internet service and that request is carried out
  - 1.1.6 describe at least three examples of Internet services that rely on client/server relationships
- 1.2 explain and demonstrate the client/server nature of the Web including:
  - 1.2.1 describe the hypertext-based nature of the Web
  - 1.2.2 describe the relationship between the Web and the Internet as a whole
  - 1.2.3 explain why the Web can be thought of as a network of hyperlinked documents
  - 1.2.4 describe and illustrate the client/server relationship that allows user agents to interact with the origin servers that make up the information repository components of the Web
  - 1.2.5 describe how the Hypertext Transfer Protocol (HTTP) is used to facilitate client/server interaction
  - 1.2.6 describe and illustrate the general flow of information through the Internet when a user agent uses a Web browser to interact with origin servers
  - 1.2.7 explain how HTTP is used to protect the transmission of data through the Web
  - 1.2.8 describe and illustrate the development of the Web in general terms using the Web 1.0, Web 2.0 and Web 3.0 generational paradigms
  - 1.2.9 compare and contrast the Web 1.0, Web 2.0 and Web 3.0 stages of development

2. **demonstrate an understanding of the general nature and purpose of Internet-oriented markup languages**
  - 2.1 describe the role markup languages play in the Web
  - 2.2 compare and contrast markup and scripting languages
  - 2.3 describe and illustrate the development of Internet-oriented markup languages in general terms including:
    - 2.3.1 explain the relationship between Standard Generalized Markup Language (SGML), Extensible Markup Language (XML), Hypertext Markup Language (HTML), Extensible Hypertext Markup Language (XHTML) and Dynamic Hypertext Markup Language (DHTML)
    - 2.3.2 explain at least two specialized Internet markup languages
3. **design, write and debug code using an appropriate Internet markup language**
  - 3.1 demonstrate the ability to use an appropriate markup language coding environment
  - 3.2 use appropriate techniques to design a markup language document including:
    - 3.2.1 determine and outline the intent of the document
    - 3.2.2 organize the document into appropriate subsections or pages
    - 3.2.3 describe the content to be carried on each page
    - 3.2.4 illustrate how the content is to be displayed
    - 3.2.5 identify the locations of the required anchors and links
  - 3.3 translate design documents into hypertext documents using code elements such as tags, attributes and hyperlinks to:
    - 3.3.1 mark off the various parts of the document
    - 3.3.2 display text and visual data in a variety of formats
    - 3.3.3 create specialized formats such as lists, tables and frames
    - 3.3.4 create both textual and image-based hyperlinks; e.g., both single images and mapped images
  - 3.4 compare the results of the script with the intent of the design document and modify, as required, including:
    - 3.4.1 use appropriate debugging techniques to compare the original design with the implemented document
    - 3.4.2 make changes, as required, to either the design and/or the document to bring both in line with the original intent
4. **demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
5. **make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE CSE1220: CLIENT-SIDE SCRIPTING 2**

**Level:** Introductory

**Prerequisite:** None

**Note:** CSE1210: Client-side Scripting 1 or an equivalent course dealing with markup scripting is strongly recommended

**Description:** Students deepen their understanding of Internet computing by using more advanced markup language techniques and by being introduced to one or more Web-specific scripting languages. As part of this process, students learn how the Web uses these resources as a means of displaying dynamic client-side information. Students learn how to analyze, modify, write and debug algorithms and scripts that use structured programming approaches.

**Parameters:** Access to appropriate computer equipment, software, support materials and the Internet. More specifically, students must have the tools they will require to design, write and debug hypermedia documents and Internet scripts.

**Supporting Courses:** CSE1210: Client-side Scripting 1  
CSE1110: Structured Programming 1  
CSE1120: Structured Programming 2

**Outcomes:** The student will:

- 1. compare and contrast static and dynamic client-side scripting**
  - 1.1 describe and illustrate the main differences, from the user's perspective, between dynamic and static client-side Web sites
  - 1.2 describe and illustrate the main differences between how dynamic and static client-side sites are implemented by the Web
  - 1.3 describe and illustrate the main advantages and disadvantages of dynamic and static client-side sites
- 2. design, write and debug scripts that use advanced markup language approaches to provide some aspects of dynamic client-side site construction**
  - 2.1 describe how markup languages can be used to provide a limited amount of client-side dynamic display through the use of forms and style sheets
  - 2.2 use appropriate techniques to design a hypertext document that employs forms and style sheets including:
    - 2.2.1 determine and outline the intent of the document
    - 2.2.2 use appropriate problem decomposition techniques to organize the document into smaller components or pages and to identify locations of any required anchors and links
    - 2.2.3 determine the content to be carried on each page and how that content is to be displayed
    - 2.2.4 identify what role style sheets have in controlling page display
    - 2.2.5 determine what role forms have in managing input and subsequent interaction
  - 2.3 write and debug scripts that translate design documents employing forms and style sheets into client-side sites by:
    - 2.3.1 identifying and using appropriate techniques for separating content and presentation through the use of inline and/or embedded style sheets
    - 2.3.2 identifying and using appropriate techniques for soliciting user input through the use of forms



- 2.3.3 using appropriate techniques to determine if the script will achieve the original intent
- 2.3.4 using appropriate internal and external documentation
- 3. **describe the general nature and purpose of Internet-oriented scripting languages**
  - 3.1 describe the role scripting languages play in the creation of Web sites
  - 3.2 compare and contrast scripting languages with markup languages and with general purpose programming languages
  - 3.3 describe and illustrate the development of Internet-oriented scripting languages in general terms
  - 3.4 describe and illustrate at least two specialized Internet-oriented scripting languages; e.g., Javascript, PERL
- 4. **design, write and debug scripts that use structured programming approaches with an appropriate Internet-oriented scripting language**
  - 4.1 demonstrate the ability to use an appropriate scripting language coding environment
  - 4.2 outline the intent of the script and determine if the intent can be realized using structured programming approaches
  - 4.3 write algorithms that use structured programming approaches to realize the intent of the script including:
    - 4.3.1 use appropriate problem decomposition techniques to break the problem into smaller components
    - 4.3.2 identify the input, processing and output requirements of each component
    - 4.3.3 further decompose each component into smaller blocks, as required, using the appropriate structures to control program flow
    - 4.3.4 write the algorithm in an acceptable format
    - 4.3.5 use appropriate techniques to determine if the algorithm will achieve the original intent
  - 4.4 translate the algorithm into a script using structured programming approaches by:
    - 4.4.1 maintaining the structure of the algorithm
    - 4.4.2 using appropriate basic or primitive data types
    - 4.4.3 using appropriate variables and constants, as required, to hold data
    - 4.4.4 using literals and input commands to provide data for processing
    - 4.4.5 using assignment, arithmetical, relational, Boolean and, where available, concatenation and string construction operators to process data
    - 4.4.6 using basic processing idioms such as accumulation, determining maximum or minimum values, as required
    - 4.4.7 using appropriate selection and iteration structures such as conditional and iterative blocks
    - 4.4.8 using output commands to display processed data in an appropriately formatted form
    - 4.4.9 using appropriate internal and external documentation
  - 4.5 execute the script tracking and eradicating errors including:
    - 4.5.1 embed the script in an appropriate markup document
    - 4.5.2 eliminate run-time and logic errors
  - 4.6 compare the results of the script's execution with the intents of the algorithm and modify, as required
- 5. **demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems



- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices



## **COURSE CSE1240:     ROBOTICS PROGRAMMING 1**

**Level:**                   Introductory

**Prerequisite:**         CSE1110: Structured Programming 1

**Description:**         Students use an appropriate Robot Control Language (RCL) to design, develop, implement and debug robotics programs that employ standard structured programming constructs and simple data structures. In the process, they develop a general understanding of robots and the robotics environment.

**Parameters:**         Access to appropriate computer equipment, software, support materials and the Internet. More specifically, students must have access to either the physical (real) or virtual (simulated) robotic environment they will require to design, write and debug RCL scripts or programs.

**Supporting Courses:**   CSE1010: Computer Science 1  
                              CSE1120: Structured Programming 2  
                              ELT1130: Robotics 1  
                              ELT1140: Robotics Applications 1

**Outcomes:**            The student will:

- 1. demonstrate a general understanding of robotics including the nature of robots, robotic control systems and the robotic environment**
  - 1.1 describe robots in general terms including:
    - 1.1.1 build a general mental model of robotic architecture by outlining the characteristics that are common to all robots
    - 1.1.2 describe the robotic characteristic of “agency”, the appearance of operating as autonomous agents and indicating the central role it plays in the concept of robot
    - 1.1.3 indicate how robots interact with their environment
  - 1.2 describe robotic control systems in general terms including:
    - 1.2.1 describe the three robotic primitives associated with robotic behaviour and their role in robotic control
    - 1.2.2 describe the three main approaches to robotic control
    - 1.2.3 use the three robotic primitives to describe how each approach to robotic control is carried out
  - 1.3 describe robotic environments in general terms including:
    - 1.3.1 describe the delimited nature of the robotic environment
    - 1.3.2 explain why robotic environments are circumscribed or limited in comparison with human environments
    - 1.3.3 describe the ideal relationship between a robot and its environment
    - 1.3.4 describe the issues associated with a mixed human/robot environment
  - 1.4 compare and contrast virtual (simulated) robots and physical (real) robots in general terms including:
    - 1.4.1 compare and contrast their architecture
    - 1.4.2 compare and contrast their control systems
    - 1.4.3 compare and contrast their environment

- 2. use a general understanding of robotics to analyze a robot operating within its environment**
  - 2.1 describe its architecture
  - 2.2 indicate how it displays “agency” or autonomous action
  - 2.3 categorize its control system
  - 2.4 describe its capabilities
  - 2.5 describe its relationship with its environment
  - 2.6 identify at least one task that the robot should be able to accomplish within its environment
  - 2.7 explain how either the robot and/or its environment could be modified to increase the number and type of tasks it could accomplish
- 3. design a robotics system consisting of at least one robot, associated control systems and environment capable of carrying out a simple set of predetermined tasks**
  - 3.1 identify the general tasks the robot will be required to carry out by:
    - 3.1.1 breaking tasks into simpler tasks and continuing the process until the tasks are reduced to primitives
    - 3.1.2 establishing the task sequence and creating a representation of those tasks
  - 3.2 describe and illustrate the environment in which the robot will be required to operate by:
    - 3.2.1 identifying elements of the environment that the robot will be able to manipulate
    - 3.2.2 identifying manipulatable elements that will act as task resources and task obstacles
    - 3.2.3 identifying variations in the environment that the robot will be able to detect; e.g., light, colour, sound
    - 3.2.4 setting the outer limits of the environment
    - 3.2.5 determining the location and type of internal barriers in the environment
    - 3.2.6 incorporating safety elements into the environment that will protect both the humans and robots operating in the environment
  - 3.3 identify the capabilities the robot will require to carry out set tasks including:
    - 3.3.1 sensing requirements
    - 3.3.2 mobility requirements
    - 3.3.3 manipulation requirements
    - 3.3.4 power requirements
    - 3.3.5 processing requirements; e.g., both calculation and data storage
  - 3.4 determine the control approach to be used to:
    - 3.4.1 determine if the robot has the capacity for autonomous operation
    - 3.4.2 determine what level of operator control will be required if the robot is not fully autonomous
  - 3.5 design the robot using the tasks to be accomplished, proposed environment, required capabilities, and control approach as parameters to determine what:
    - 3.5.1 type of kinematic chain or body will be required to provide a platform for the other components
    - 3.5.2 actuators and end effectors will be required and how they will be mounted on the body
    - 3.5.3 sensors will be required and how they will be mounted on the body
    - 3.5.4 control components will be required and how they will be mounted on the body
    - 3.5.5 power or energy components will be required and how they will be mounted on the body
  - 3.6 check your design for congruency against the task list to be accomplished and with the proposed environmental specifications
  - 3.7 modify the design, as required
  - 3.8 carry out the design process sequentially using a top-down approach and employing stepwise refinement
- 4. use an iterative process to build the environment, robot and controlling mechanism called for by the design**
  - 4.1 construct that portion of the environment required for the first task or tasks in the task sequence
  - 4.2 assemble as much of the robot, as is required, to accomplish the task or tasks



- 4.3 write algorithms that use structured programming approaches to accomplish the task or set of tasks including:
  - 4.3.1 use appropriate problem decomposition techniques to break the task into subtasks
  - 4.3.2 identify the sense, plan and action requirements of each subtask
  - 4.3.3 further decompose each subtask into smaller blocks, as required, using the appropriate structures to control program flow
  - 4.3.4 write the algorithm in an approved format such as a structured chart or pseudocode
  - 4.3.5 use appropriate techniques to determine if the algorithm will achieve the original intent
- 4.4 use an RCL capable of writing structured code to translate the algorithm for the set of tasks into a program including:
  - 4.4.1 maintain the structure of the algorithm
  - 4.4.2 use appropriate basic or primitive data types and variable and constant names, as required, to hold data
  - 4.4.3 use literals and input commands to accept data from sensors to provide data for processing
  - 4.4.4 use operators and basic processing idioms as required; e.g., accumulation, determination of maximum or minimum values
  - 4.4.5 use appropriate selection and iteration structure; e.g., conditional, iterative blocks
  - 4.4.6 use output commands to display processed data to the operator as well as activate actuators; e.g., motors, grippers
  - 4.4.7 document appropriately
- 4.5 load and execute the program tracking and eradicating errors by:
  - 4.5.1 testing each of the physical subsystems of the robot(s) to eliminate engineering errors
  - 4.5.2 testing the robot(s) within the appropriate section of the environment to confirm that the robot is interacting with the environment as called for by the algorithm
  - 4.5.3 using self-test code and check points, as well as observation, to eliminate run-time and internal logic errors
  - 4.5.4 comparing the robot's actions with the intent of the algorithm
  - 4.5.5 modifying the original task list, environment, algorithm and/or program, as required
- 4.6 participate in interim critiques throughout the iterative process; e.g., planning, analysis, design, testing, evaluation

## **5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

## **6. make personal connections to the cluster content and processes to inform possible pathway choices**

- 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 6.2 create a connection between a personal inventory and occupational choices



**COURSE CSE1910: CSE PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices



**COURSE CSE2010: COMPUTER SCIENCE 2**

**Level:** Intermediate

**Prerequisites:** CSE1010: Computer Science 1  
CSE1120: Structured Programming 2

**Description:** Students explore hardware, software and processes at an intermediate level. Students extend their understanding of software development by learning how to layer modular programming approaches over structured programming techniques to improve the efficiency and robustness of algorithms and programs. They also are introduced to derived data types to provide them with data structures suitable for more demanding problems. Students add to their understanding of the hardware side of computer science by exploring a stylized von Neumann computer system at the machine level, and of the social side of computer science by examining some of the issues that have arisen from the implementation of computer technology.

**Parameters:** Access to an appropriate computer work station, materials, the Internet, a programming language/environment and associated support resources. It is recommended that the course be taught in tandem with one or more programming courses dealing with modular programming.

**Supporting Courses:** CSE2110: Procedural Programming 1  
CSE2120: Data Structures 1  
CSE2130: Files & File Structures 1 and/or any  
Intermediate or advanced project course involving modular programming

**Outcomes:** The student will:

- 1. identify and describe past, present and potential developments in computer technology**
  - 1.1 analyze and explain the qualitative trends of the application of computer technology over time particularly the shift in focus, in the recent past, from traditional computation, information warehousing (databases), and automation and cybernetics to the present focus on communication, social and commercial networking, entertainment and artificial intelligence, and to a future focus on bionics and cyborganization and artificial life
  - 1.2 analyze and explain the quantitative trends in the application of computer technology over time including the expansion, in the recent past, from the military, scientific community, government, and large and medium-sized institutions, to the present expansion into small institutions, the home, industrial and domestic machines and personal information managers, and to the projected expansion into personal expert systems, implanted systems and artificial life
  - 1.3 identify and describe areas of ethical and moral concerns arising from the permeation of computer technology in society including:
    - 1.3.1 privacy issues; e.g., data mining and database consolidation, tracking of financial transactions, e-mail and other communications monitoring
    - 1.3.2 security issues; e.g., identity and information theft
    - 1.3.3 equality issues; e.g., emergence of the "digital divide"
    - 1.3.4 freedom issues; e.g., privatization of information and control of information flow

- 2. explain and demonstrate the nature, evolution and key approaches associated with the modular programming paradigm**
  - 2.1 demonstrate iterative and incremental approaches to the analysis and design stages of the software development process
  - 2.2 demonstrate the analysis step of an appropriate Systems Development Life Cycle (SDLC) using modular approaches including:
    - 2.2.1 problem parsing and decomposition
    - 2.2.2 identification of subtasks
    - 2.2.3 data structuring
    - 2.2.4 operation identification
  - 2.3 demonstrate the design step of an appropriate SDLC using modular approaches including:
    - 2.3.1 top-down design
    - 2.3.2 stepwise refinement
    - 2.3.3 scope considerations with an emphasis on avoiding global data
    - 2.3.4 modular implementation
    - 2.3.5 appropriate coupling approaches
    - 2.3.6 appropriate levels of cohesion
    - 2.3.7 reusable modules and submodules
    - 2.3.8 data dictionaries, where required
    - 2.3.9 bottom-up coding, where appropriate
- 3. explain and demonstrate the conversion of general modular algorithms into modular programs through the use of subprograms, procedural abstraction and the use of local scope to protect data, and other tools**
  - 3.1 explain the following:
    - 3.1.1 hierarchy plus input/process/output (HIPO) charting
    - 3.1.2 structure diagrams
    - 3.1.3 Warnier/Orr diagrams
- 4. development, structure and use of key algorithms associated with modular approaches and the application of these idioms to create more complex algorithms**
  - 4.1 demonstrate an understanding of a number of core algorithms associated with derived data types including:
    - 4.1.1 traversing
    - 4.1.2 searching
    - 4.1.3 sorting
    - 4.1.4 merging
  - 4.2 demonstrate the ability to prepare the algorithm for the development or coding stage of an appropriate SDLC using modular approaches including:
    - 4.2.1 subprograms
    - 4.2.2 procedures/functions
    - 4.2.3 stub programming
    - 4.2.4 prototyping
    - 4.2.5 libraries

- 5. explain and demonstrate the rationale, structure and key uses of the fundamental derived data types**
  - 5.1 demonstrate the ability to incorporate derived data types including:
    - 5.1.1 arrays
    - 5.1.2 vectors
    - 5.1.3 matrices
    - 5.1.4 enumerated data
    - 5.1.5 records; e.g., data structures with mixed data types
  - 5.2 demonstrate symbolic data representation, using ASCII coding
- 6. explain and demonstrate the rationale, structure and key uses of text files**
- 7. explain and analyze the nature, operation and basic architecture of the von Neumann computer system at the machine level**
  - 7.1 demonstrate an understanding of the machine level organization of a hypothetical von Neumann machine by describing and representing:
    - 7.1.1 the basic components of the Central Processing Unit (CPU), Arithmetic Logic Unit (ALU), control unit, registers, program counter and instruction register
    - 7.1.2 the bus
    - 7.1.3 the memory
  - 7.2 demonstrate an understanding of the machine language of a hypothetical von Neumann machine by describing and representing:
    - 7.2.1 opcodes
    - 7.2.2 operands
    - 7.2.3 symbolic representation
  - 7.3 demonstrate an understanding of the machine level operations of a hypothetical von Neumann machine by describing and representing:
    - 7.3.1 the machine cycle; e.g., fetch, decode, execute
    - 7.3.2 the flow of data through the computer under the direction of a hypothetical machine-language program
  - 7.4 demonstrate the mediating role played by system software between the human level and machine level including:
    - 7.4.1 operating systems
    - 7.4.2 language translators
    - 7.4.3 memory managers
    - 7.4.4 information managers
    - 7.4.5 schedulers
    - 7.4.6 utilities
- 8. demonstrate basic competencies**
  - 8.1 demonstrate fundamental skills to:
    - 8.1.1 communicate
    - 8.1.2 manage information
    - 8.1.3 use numbers
    - 8.1.4 think and solve problems
  - 8.2 demonstrate personal management skills to:
    - 8.2.1 demonstrate positive attitudes and behaviours
    - 8.2.2 be responsible
    - 8.2.3 be adaptable
    - 8.2.4 learn continuously
    - 8.2.5 work safely

- 8.3 demonstrate teamwork skills to:
  - 8.3.1 work with others
  - 8.3.2 participate in projects and tasks
- 9. **identify possible life roles related to the skills and content of this cluster**
  - 9.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 9.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CSE2110: PROCEDURAL PROGRAMMING 1**

**Level:** Intermediate

**Prerequisite:** CSE1120: Structured Programming 2

**Description:** Students develop their understanding of the procedural programming paradigm. They move from a structured programming approach in which modules were handled through the use of program blocks to a more formal modular programming approach in which they are handled through subprograms. In the process, students also learn to use a number of new design approaches made possible by the new paradigms. As part of this process, they also learn what types of problems are amenable to modular algorithms and programs.

**Parameters:** Access to appropriate computer equipment, software, support materials, the Internet and a programming environment that encourages modular programming through the use of subprograms.

**Supporting Courses:** CSE2010: Computer Science 2  
CSE2120: Data Structures 1  
CSE2130: Files & File Structures 1, and/or any  
Intermediate project course involving imperative programming

**Outcomes:** The student will:

### **1. demonstrate an understanding of modular programming**

- 1.1 describe the advantages of programming with modules or subroutines including:
  - 1.1.1 reducing the duplication of code in a program
  - 1.1.2 enabling the reuse of code in more than one program
  - 1.1.3 decomposing complex problems into simpler pieces to improve maintainability and extendibility
  - 1.1.4 improving the readability of a program
  - 1.1.5 hiding or protecting the program data
- 1.2 select a programming environment and describe how it supports procedural programming including:
  - 1.2.1 the type of subprograms supported; e.g., procedures, functions, methods
  - 1.2.2 the level or type of modularity provided
  - 1.2.3 the level of protection provided from unwanted side-effects

### **2. demonstrate basic procedural programming skills by writing algorithms employing a modular approach to solve problems**

- 2.1 analyze a data processing problem and use a top-down design approach to decompose it into discreet input, processing and output modules
- 2.2 analyze and refine modules into submodules that are a manageable size for each process; e.g., input submodules, processing submodules and output submodules
- 2.3 describe and represent, using pseudocode or an appropriate diagramming approach, the relationship among the modules

- 2.4 analyze and rewrite algorithms for each module identifying the pre- and post-conditions and required program control of flow mechanisms.
- 2.5 analyze and evaluate algorithms for each developing module with appropriate data and revise, as required
- 3. translate algorithms into source code, convert the source code into machine executable form, execute and debug, as required**
  - 3.1 convert an algorithm into a program of linked subprograms with a main or client module calling other modules in a manner that reflects the structure of the algorithm
  - 3.2 use appropriate types of subprograms to implement the various sections of the algorithm; e.g., functions (subprograms that return a value) and procedures (subprograms that do not return a value)
  - 3.3 analyze and determine the type of scope required to protect and/or hide data and keep implementation decoupled from the calling modules and to avoid unwanted side-effects with consideration to:
    - 3.3.1 use of appropriate parameters for importing and exporting data to and from subprograms
    - 3.3.2 use of local variables and nested subprograms to enhance cohesion
    - 3.3.3 one- and two-way parameter passing for importing and exporting data to and from subprograms
  - 3.4 analyze for, and maintain, an appropriate balance between the coupling or dependency and cohesion or focus of subprograms
  - 3.5 create both internal and external documentation
  - 3.6 analyze the program and eliminate syntax, run-time and logic errors by using appropriate test data for each programming task at each stage of development
- 4. compare the results of the program with the intent of the algorithm and modify, as required**
  - 4.1 use appropriate error trapping mechanisms built into the programming environment, as well as programmer-directed error-trapping techniques, to eliminate logic errors and debug the program
  - 4.2 compare the congruency between the outcomes of the debugged program and the original intent of the algorithm and modify, as required
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CSE2120: DATA STRUCTURES 1**

**Level:** Intermediate

**Prerequisite:** CSE2110: Procedural Programming 1

**Description:** Students learn how to design code and debug programs that use a set of data structures that can be used to handle lists of related data. Building on their knowledge of basic or primitive data types, they learn how to work with fundamental data structures such as the array and the record. As part of this process, they learn what types of problems benefit from the use of these types of data structures.

**Parameters:** Access to appropriate computer equipment, software, support materials, the Internet and a programming environment that encourages modular programming through the use of subprograms.

**Supporting Courses:** CSE2010: Computer Science 2  
CSE2130: Files & File Structures 1 and/or any  
Intermediate project course involving imperative programming

**Outcomes:** The student will:

- 1. analyze and represent the nature, structure and utility of fundamental data types**
  - 1.1 describe and represent the general nature of static data structures including:
    - 1.1.1 how data structures are stored in memory
    - 1.1.2 the advantages and disadvantages of fundamental data structures in relation to primitive data types
    - 1.1.3 the advantages and disadvantages of the various fundamental data structures
  - 1.2 describe and represent the nature and mechanics of basic data structures including:
    - 1.2.1 the static array including: use of cells to store data, data homogeneity, use of an index (or indices) to identify the location of data elements, types; e.g., single dimensional arrays (lists), double dimensional arrays (tables) and parallel arrays (look-up or associative tables)
    - 1.2.2 the record including: the use of fields to store data, data heterogeneity, the use of field names to identify the location of data elements
    - 1.2.3 the dynamic array including: sizes, types; e.g., single dimensional arrays (lists), double dimensional arrays (tables) and parallel arrays (look-up or associative tables)
  - 1.3 describe and represent the operations associated with data structures including:
    - 1.3.1 creating the structure
    - 1.3.2 inserting, deleting and replacing data in the structure
    - 1.3.3 searching, finding and retrieving data from the structure
    - 1.3.4 determining the size of the structure
    - 1.3.5 copying the structure
    - 1.3.6 comparing two structures of the same type



- 2. create and/or modify algorithms that make effective use of fundamental data structures to solve problems**
  - 2.1 use appropriate general design techniques for a specific programming environment
  - 2.2 analyze and decompose the problem into appropriate subsections using techniques appropriate for the chosen design approach
  - 2.3 evaluate subsections and identify any that may require some type of fundamental data structure, based on the nature of the data to be processed and type of processing operations
  - 2.4 identify and use or construct the appropriate data structure; e.g., array, using appropriate variant or variants, where required
  - 2.5 identify and sequence the operations required to process the data to be contained in the data structure
  - 2.6 sequence the various subsections appropriately
  - 2.7 test and modify the algorithm using appropriate “fail-on-paper” techniques
- 3. create and/or modify programs based on algorithms that make effective use of fundamental data structures**
  - 3.1 convert algorithms calling for the use of data structures into programs that reflect the algorithm’s design
  - 3.2 use cohesive subprograms with helper subprograms to hide and/or protect data and separate the implementation of the data structure and its operations from its calling modules
  - 3.3 use original (user-created) or built-in, environment supported data structures and their attendant operations appropriate to the data being manipulated
- 4. compare program operation and outcomes with the intent of the algorithm and modify, as required**
  - 4.1 use appropriate error-trapping mechanisms built into the programming environment, as well as programmer-directed error-trapping techniques, to eliminate logic errors and debug the program
  - 4.2 compare the congruency between the outcomes of the debugged program and the original intent of the algorithm and modify both, as required
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CSE2130: FILES & FILE STRUCTURES 1**

**Level:** Intermediate

**Prerequisite:** CSE2120: Data Structures 1

**Description:** Students learn how to design, code and debug programs that use data files to store and retrieve data on secondary storage devices. Building on their knowledge of derived data structures, they learn how to use those structures to organize data for efficient file handling. As part of this process, they learn what types of problems benefit from the use of external files.

**Parameters:** Access to appropriate computer equipment, software, support materials, the Internet and a programming environment that encourages modular programming through the use of subprograms.

**Supporting courses:** CSE2010: Computer Science 2, or any Intermediate project course involving the manipulation and storing of data

**Outcomes:** The student will:

### **1. analyze and represent the nature, structure and utility of external data files**

- 1.1 identify and illustrate the general characteristics of external data files including:
  - 1.1.1 access methods; e.g., sequential, random, indexed
  - 1.1.2 type of data; e.g., text (encoded in a format such as ASCII code), binary (encoded in binary code)
  - 1.1.3 text files; e.g., data organization, access methods
- 1.2 explain and represent the client/server relationship that exists between a file using application and the operating system with consideration to:
  - 1.2.1 how programming environments access secondary storage devices
  - 1.2.2 how operating systems handle the actual process of manipulating data in secondary memory
  - 1.2.3 how programming environments request file handling services from the operating system
  - 1.2.4 the use of a file buffer, data stream and file descriptor table
- 1.3 describe and represent the logical structure of text files including:
  - 1.3.1 sequential text
  - 1.3.2 random-access text files
  - 1.3.3 Indexed Sequential Access Method (ISAM) text files
- 1.4 describe the main operations associated with text files including:
  - 1.4.1 creating a file buffer or stream
  - 1.4.2 opening an existing file
  - 1.4.3 creating a new file
  - 1.4.4 exporting data to a file
  - 1.4.5 importing data from a file
  - 1.4.6 appending data to a file
  - 1.4.7 closing a file
  - 1.4.8 comparing two files
  - 1.4.9 copying a file
  - 1.4.10 merging two files

- 1.5 describe and represent the relative advantages of each file type including:
  - 1.5.1 access speed
  - 1.5.2 storage space requirement
  - 1.5.3 difficulty to implement
  - 1.5.4 maintainability
- 2. create and/or modify algorithms that make effective use of external data files**
  - 2.1 use appropriate general design techniques for a specific programming environment
  - 2.2 analyze and decompose the problem into appropriate subsections using techniques appropriate for the chosen design approach
  - 2.3 evaluate subsections and identify any that may require some type of external file capability, based on the nature and amount of the data to be processed and type of processing operations
  - 2.4 identify and use or construct the appropriate external file structure based on:
    - 2.4.1 storage space required
    - 2.4.2 the number and speed of required operations
    - 2.4.3 programmer efficiency
  - 2.5 create sequential and random-access files, as required
  - 2.6 identify and sequence the operations needed to process the data prior to export and/or process the data after import
  - 2.7 test and modify the algorithm using appropriate “fail-on-paper” techniques
- 3. create and/or modify programs based on appropriate algorithms that make effective use of external data files**
  - 3.1 convert algorithms calling for the use of external data files into programs that reflect the algorithm’s design
  - 3.2 use cohesive subprograms with helper subprograms, if required, to hide and/or protect data, and separate the implementation of the file handling code and attendant data structure and operations from its calling modules
  - 3.3 use original (user-created) or built-in, environment supported file handling code segments and their attendant operations appropriate to the data being manipulated
- 4. compare program operation and outcomes with the intent of the algorithm and modify, as required**
  - 4.1 use appropriate error-trapping mechanisms built into the programming environment, as well as programmer-directed error-trapping techniques, to eliminate logic errors and debug the program
  - 4.2 compare the congruency between the outcomes of the debugged program and the original intent of the algorithm and modify both, as required
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities





## **COURSE CSE2140: SECOND LANGUAGE PROGRAMMING 1**

**Level:** Intermediate

**Prerequisite:** CSE2110: Procedural Programming 1 or  
CSE1120: Structured Programming 2

**Description:** Students who have mastered the basics of one programming language are given the opportunity to learn the basics of another. Designed for students who have learned how to write structured and/or modular programs in a more accessible programming environment, this course gives students an opportunity to develop a similar skill set in a more demanding language. In the process, they have a further opportunity to hone their structured and modular programming skills.

**Parameters:** Access to appropriate computer equipment, software, support materials, the Internet and a programming environment that encourages structured and modular programming.

**Supporting Courses:** CSE1010: Computer Science 1  
CSE1110: Structured Programming 1  
CSE1120: Structured Programming 2 and/or any  
Intermediate project course involving structured and modular programming

**Outcomes:** The student will:

1. **compare and contrast a new language with a previously learned language**
  - 1.1 consider the programming paradigms supported by each language including:
    - 1.1.1 naming the paradigms supported
    - 1.1.2 outlining the relative advantages and disadvantages of the paradigms
  - 1.2 consider the source code to machine code translation process used by each language by:
    - 1.2.1 identifying and describing the process used by each language
    - 1.2.2 outlining the relative advantages and disadvantages of each language
  - 1.3 consider the language characteristics including:
    - 1.3.1 language level; e.g., low, high, very high
    - 1.3.2 level of type; e.g., strongly typed, weakly typed
    - 1.3.3 nature of the source code; e.g., iconic, widgets, graphical
    - 1.3.4 difficulty to construct source code; e.g., attendant learning curve
    - 1.3.5 programming resources and aids
  - 1.4 consider the modular characteristics of each language including:
    - 1.4.1 types of subprograms supported
    - 1.4.2 how modularity is supported
    - 1.4.3 level of module cohesion possible
    - 1.4.4 amount of module coupling required

- 2. demonstrate programming skills by writing modular structured algorithms in a second language**
  - 2.1 analyze a data processing problem and use a top-down design approach to decompose it into discreet input, processing, output (IPO) modules
  - 2.2 analyze and refine modules into submodules that are a manageable size for each process; e.g., IPO submodules
  - 2.3 describe and represent, using pseudocode or an appropriate diagramming approach, the relationship among the modules
  - 2.4 analyze and rewrite algorithms for each module identifying the pre- and post-conditions and required program control of flow mechanisms
  - 2.5 analyze and evaluate algorithms for each developing module with appropriate data and revise, as required
- 3. demonstrate basic coding skills by drawing on first language skills to translate modular structured algorithms into executable programs in the second language**
  - 3.1 convert an algorithm into a program of linked subprograms with a main or client module calling other modules in a manner that reflects the structure of the algorithm
  - 3.2 use appropriate types of subprograms to implement the various sections of the algorithm; e.g., functions (subprograms that return a value) and procedures (subprograms that do not return a value)
  - 3.3 analyze and determine, in a second language, the type of scope required to protect and/or hide data and keep implementation decoupled from the calling modules and to avoid unwanted side effects with consideration of:
    - 3.3.1 the use of appropriate parameters for importing and exporting data to and from the subprograms
    - 3.3.2 the use of local variables and nested subprograms to enhance cohesion
    - 3.3.3 one- and two-way parameter passing for importing and exporting data to and from the subprograms
  - 3.4 analyze for, and maintain, an appropriate balance between the coupling or dependency and cohesion or focus of the subprograms
  - 3.5 create both internal and external documentation
  - 3.6 analyze the program and eliminate syntax, run-time and logic errors by using appropriate test data for each programming task at each stage of development
- 4. compare the results of the program with the intent of the algorithm and modify, as required**
  - 4.1 use appropriate error-trapping mechanisms built into the programming environment, as well as programmer-directed error-trapping techniques, to eliminate logic errors and debug the program
  - 4.2 compare the congruency between outcomes of the debugged program and the original intent of the algorithm and modify both, as required
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely

- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities





## **COURSE CSE2210: CLIENT-SIDE SCRIPTING 3**

**Level:** Intermediate

**Prerequisites:** CSE1220: Client-side Scripting 2  
CSE1120: Structured Programming 2

**Description:** Students add to their understanding of Internet scripting by employing procedural programming techniques and fundamental data structures to create both static and dynamic client-side sites. Students learn how to analyze, modify, write and debug algorithms and scripts that use subprograms such as functions and data structures such as arrays.

**Parameters:** Access to appropriate computer equipment, software, support materials and the Internet. Specifically, students must have access to a scripting environment that encourages procedural programming.

**Supporting Courses:** CSE2010: Computer Science 2  
CSE2110: Procedural Programming 1  
CSE2120: Data Structures 1

**Outcomes:** The student will:

- 1. demonstrate basic procedural programming approaches and how they can be used to write Internet scripts**
  - 1.1 include the following features:
    - 1.1.1 subprograms that can be readily mapped to specific components of a site's architecture
    - 1.1.2 the decomposition of complex scripting tasks into subtasks improving site design efficiency, maintainability and extendibility
    - 1.1.3 the potential for code reuse both in the same and in other scripts and sites
    - 1.1.4 the enhancement of site security through improved data hiding and information protection
    - 1.1.5 the enhancement of the readability of site scripts
    - 1.1.6 the promotion of collaborative work on site scripts
    - 1.1.7 the reduction of unwanted side effects especially when dealing with multiple scripts
- 2. demonstrate basic procedural programming approaches and how they can be used to create development libraries of scriptlets**
  - 2.1 demonstrate how they:
    - 2.1.1 increase design, coding and debugging efficiency
    - 2.1.2 increase user and/or site interactivity
- 3. demonstrate the use of data structures in an Internet scripting environment**
  - 3.1 outline the data structures available in a typical Internet scripting environment
  - 3.2 compare and contrast data structures such as arrays with primitive data types
  - 3.3 describe and represent the main operations associated with the fundamental data structures supported by a typical Internet scripting environment
- 4. design scripts for an appropriate Internet-oriented scripting environment that uses procedural programming approaches and fundamental data structures**
  - 4.1 outline the intent of the script and determine if the intent can be best realized through the use of procedural programming approaches
  - 4.2 determine the data requirements of the script and determine if the intent can be best realized through the use of fundamental data structures

- 4.3 create algorithms that use procedural programming approaches to realize the intent of the script including:
  - 4.3.1 use a top-down design approach to decompose the problem first into modules and then into submodules
  - 4.3.2 use pseudocode or an appropriate diagramming technique to illustrate the relationship among the modules
  - 4.3.3 create more detailed algorithms for each module identifying the pre- and post-conditions and required program control of flow mechanisms
  - 4.3.4 test and modify the developing algorithm with appropriate data using a “fail-on-paper” process
- 5. write and debug scripts that use procedural programming approaches and fundamental data structures using an appropriate Internet-oriented scripting environment**
  - 5.1 demonstrate the ability to use an appropriate scripting language coding environment
  - 5.2 convert the algorithms into scripts consisting of linked modules/subprograms that reflect the structure of the algorithm
  - 5.3 use appropriate types of subprograms to implement the various sections of the algorithm
  - 5.4 maintain an appropriate balance between the coupling or dependency and cohesion or focus of the subprograms
  - 5.5 use internal and external documentation
  - 5.6 execute the script, and track and eradicate errors
  - 5.7 compare the results of the script’s execution with the intent of the algorithm and modify, as required
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. identify possible life roles related to the skills and content of this cluster**
  - 7.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 7.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CSE2240: ROBOTICS PROGRAMMING 2**

**Level:** Intermediate

**Prerequisites:** CSE1240: Robotics Programming 1  
CSE1120: Structured Programming 2

**Description:** Students add to their understanding of robotics programming by employing procedural programming techniques and fundamental data structures to create programs that display greater agency and autonomy. They learn how to analyze, modify, write and debug robotics algorithms and programs in which modularity is achieved through subprograms such as functions and fundamental data structures such as arrays.

**Parameters:** Access to appropriate computer equipment, software, support materials and the Internet. More specifically, students must have access to either the physical (real) or virtual (simulated) robotic environments they will require to design, write and debug Robot Control Language (RCL) scripts or programs.

**Supporting Courses:** CSE2010: Computer Science 2  
CSE2110: Procedural Programming 1  
CSE2120: Data Structures 1  
ELT2140: Robotics 2  
ELT2160: Robotics Sensor 1  
ELT2170: Robotics Sensor 2

**Outcomes:** The student will:

- 1. demonstrate how basic procedural programming approaches can be used to create robotics programs**
  - 1.1 include the following:
    - 1.1.1 subprograms that can be readily mapped to specific subsections of a robot's architecture
    - 1.1.2 the decomposition of complex robotic tasks into subtasks improving both the maintainability and extendibility of the programs
    - 1.1.3 the potential for code reuse both in the same and in other robotics programs
    - 1.1.4 the promotion of data hiding and information protection in robotics programs
    - 1.1.5 the enhancement of the readability of a robotics program
    - 1.1.6 the reduction in side effect errors
- 2. demonstrate how basic procedural programming approaches can be used to create task libraries**
  - 2.1 demonstrate how they:
    - 2.1.1 increase design, coding and debugging efficiency
    - 2.1.2 can improve robotic artificial intelligence leading to programs that display greater agency and/or autonomy
- 3. demonstrate an understanding of data structures such as arrays and how they can be used in robotics**
  - 3.1 outline and describe the data structures available in a typical robotic programming environment
  - 3.2 outline the main advantages of data structures such as arrays over primitive data types in robotics programming
  - 3.3 describe and illustrate the main operations associated with the data structures supported by a robotic programming environment



- 3.4 describe and demonstrate how data structures can be used to simulate aspects of human cognition such as memory in robotics programs
- 4. design a robotics system consisting of at least one robot, associated control systems and environment that use procedural programming approaches and fundamental data structures to carry out a simple set of predetermined tasks**
  - 4.1 identify the general tasks the robot will be required to carry out including:
    - 4.1.1 breaking those tasks into simpler tasks by continuing the process until each task can be treated as a subprogram
    - 4.1.2 drafting a task hierarchy that associates the tasks and subtasks
  - 4.2 describe and diagram the environment in which the robot will be required to operate by:
    - 4.2.1 identifying the elements in the environment that can be manipulated by the robot and determining their location
    - 4.2.2 identifying the elements in the environment to be detected by the robot's sensors and determining their location
    - 4.2.3 determining the type and location of internal barriers in the environment
    - 4.2.4 setting the outer limits of the environment
  - 4.3 identify the capabilities the robot will require to carry out the tasks
  - 4.4 determine the control approach to be used, including what level of operator control will be required if the robot cannot support a fully autonomous mode of operation
  - 4.5 design the robot, using the tasks to be accomplished, the proposed environment, the required capabilities and the control approach as parameters
  - 4.6 check your design for congruency against the task list to be accomplished and with the proposed environmental specifications
  - 4.7 modify the design, as required
  - 4.8 carry out the design process sequentially using a top-down approach and employ stepwise refinement
- 5. use procedural programming approaches to build the environment, robot and controlling mechanism called for by the design**
  - 5.1 construct that portion of the environment required for the first task or tasks on the task sequence
  - 5.2 assemble as much of the robot, as is required, to accomplish those tasks
  - 5.3 write algorithms that use modular programming approaches to outline how the first set of tasks is to be accomplished including:
    - 5.3.1 use appropriate problem decomposition techniques to break each task into subtasks capable of being represented as modules
    - 5.3.2 identify the sense, plan and action component of each module
    - 5.3.3 identify the data requirements of each module and determine which requirements should be met by fundamental data types
    - 5.3.4 organize each module, as required, using the appropriate structures to control program flow
    - 5.3.5 link the modules into calling and called modules
    - 5.3.6 write the algorithm in an acceptable format
    - 5.3.7 use appropriate techniques to determine if the algorithm will achieve the original intent
  - 5.4 use an RCL, capable of using structured and procedural approaches and supporting fundamental data structures, to translate the algorithms into a program including:
    - 5.4.1 convert the algorithms into programs consisting of linked modules/subprograms that reflect the structure of the algorithm
    - 5.4.2 use appropriate types of subprograms to implement the various sections of the algorithm
    - 5.4.3 maintain an appropriate balance between the coupling or dependency and cohesion or focus of the subprograms
    - 5.4.4 pass data between the subprograms without unintended side effects
    - 5.4.5 use internal and external documentation



- 5.5 load and execute program, and track and eradicate errors by:
  - 5.5.1 testing each of the physical subsystems of the robot(s) to eliminate engineering errors
  - 5.5.2 testing the robot(s) within the appropriate section of the environment to confirm that the robot is interacting with the environment as called for by the algorithm
  - 5.5.3 using self-test code and check points in each module, as well as observation, to eliminate run-time and internal logic errors
  - 5.5.4 comparing the robot's actions with the intent of the algorithm
  - 5.5.5 modifying the original task list, environment, algorithm and/or program, as required
- 5.6 participate in intermittent critiques throughout the iterative process; e.g., planning, analysis, design, testing, evaluation
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. identify possible life roles related to the skills and content of this cluster**
  - 7.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 7.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CSE2910: CSE PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

#### **1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

#### **2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

#### **3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CSE2920: CSE PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

#### **1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

#### **2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

#### **3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CSE3010: COMPUTER SCIENCE 3**

**Level:** Advanced

**Prerequisites:** CSE2010: Computer Science 2  
CSE2110: Procedural Programming 1

**Description:** Students explore hardware, software and associated processes at an advanced level. They extend their understanding of software development by moving from procedural programming approaches to an object-oriented approach. In the process they learn how object-oriented programming (OOP) can improve the efficiency and robustness of algorithm development and program construction. They deepen their understanding of the hardware side of computer science by exploring the connection between the binary/hexadecimal number systems and some of the simple logic gates that are the basis of the von Neumann computer. They also add to their understanding of the social implications of computer science by examining the emerging information society.

**Parameters:** Access to an appropriate computer work station, the Internet, a programming language/environment and support resources. It is recommended that the course be taught in tandem with one or more programming courses dealing with OOP.

**Supporting Courses:** CSE3110: Iterative Algorithm 1  
CSE3120: Object-oriented Programming 1 or any  
Advanced project course involving OOP

**Outcomes:** The student will:

- 1. analyze and explain the historical roots and general nature of the information revolution and the emerging information, knowledge-based society**
  - 1.1 analyze and explain the:
    - 1.1.1 technological roots of the information revolution
    - 1.1.2 general economic impact
    - 1.1.3 social impact
    - 1.1.4 political impact
    - 1.1.5 shift from the Industrial Revolution to the Information Age
- 2. explain and represent the nature, rationale and key approaches associated with OOP**
  - 2.1 compare and contrast procedural programming and OOP approaches highlighting the:
    - 2.1.1 approach to modularity
    - 2.1.2 protection and hiding of data
    - 2.1.3 use of interfaces to maintain implementation independence
    - 2.1.4 approaches to organizing algorithms and programs
    - 2.1.5 respective focus of OOP and structured programming

- 2.2 describe key aspects of object-oriented design and OOP including:
  - 2.2.1 abstraction, encapsulation, inheritance and polymorphism
  - 2.2.2 classes, class libraries, objects and instantiation
  - 2.2.3 data members (properties) and member functions (behaviours)
  - 2.2.4 public and private access modifiers
  - 2.2.5 message passing and object networks
- 3. demonstrate object-oriented design techniques**
  - 3.1 demonstrate requirement analysis including:
    - 3.1.1 case analysis
    - 3.1.2 domain analysis
    - 3.1.3 object diagrams
  - 3.2 demonstrate iterative class design using:
    - 3.2.1 principal classes
    - 3.2.2 elaboration of object diagrams
    - 3.2.3 class-responsibility-collaboration cards
    - 3.2.4 iterative prototyping
  - 3.3 demonstrate appropriate relationships including:
    - 3.3.1 dependency
    - 3.3.2 association
    - 3.3.3 aggregation
    - 3.3.4 composition
- 4. explain and demonstrate the relationship between binary and hexadecimal number systems, data encoding, logic gates and the digital computer**
  - 4.1 describe and represent the binary and hexadecimal system by:
    - 4.1.1 comparing and contrasting each system with the decimal system
    - 4.1.2 converting numbers from one system to another
    - 4.1.3 describing and demonstrating the role each system plays in encoding data for digital computing
  - 4.2 describe and represent binary arithmetic by:
    - 4.2.1 creating a simple binary addition truth table
    - 4.2.2 creating simple binary truth tables for basic logical states such as logical conjunction (AND), logical disjunction (OR) and logical negation (NOT)
  - 4.3 describe and represent circuits (general and logic) using binary notation including:
    - 4.3.1 AND
    - 4.3.2 OR
    - 4.3.3 NOT
    - 4.3.4 NAND and NOR
  - 4.4 describe and represent simple operations with logic gates including:
    - 4.4.1 binary addition with full and half adders
    - 4.4.2 binary subtraction with full and half subtractors
    - 4.4.3 tasks involving selection
    - 4.4.4 tasks involving inversion
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems



- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



**COURSE CSE3020: COMPUTER SCIENCE 4**

**Level:** Advanced

**Prerequisites:** CSE3010: Computer Science 3  
CSE3110: Iterative Algorithms 1

**Description:** Students enhance their learning by studying a set of standard abstract data types and the dynamic data structures conventionally used to implement them. They also add to their general understanding of algorithms by learning how to conduct asymptotic analyses of algorithmic efficiency and indicate that efficiency using big O notation. Students continue their exploration of the hardware aspect of computer science by exploring a different type of computer architecture, the Turing machine.

**Parameters:** Access to an appropriate computer work station, the Internet, a programming language/environment, preferably one that supports object-oriented programming, and associated support resources. It is recommended that the course be taught in tandem with one or more programming courses dealing with dynamic abstract data types and their implementation.

**Supporting Courses:** CSE3310: Recursive Algorithms 1  
CSE3320: Dynamic Data Structures 1 or any  
Advanced project course involving abstract data type programming

Outcomes:	The student will:
1. Explain the importance of the cell membrane and its components.	1. Identify the components of the cell membrane.
2. Describe the structure and function of the nucleus.	2. Identify the components of the nucleus.
3. Explain the process of protein synthesis.	3. Identify the components of the ribosome.
4. Describe the structure and function of the mitochondrion.	4. Identify the components of the mitochondrion.
5. Explain the process of cellular respiration.	5. Identify the components of the electron transport chain.
6. Describe the structure and function of the Golgi apparatus.	6. Identify the components of the Golgi apparatus.
7. Explain the process of cell division.	7. Identify the components of the cell cycle.
8. Describe the structure and function of the lysosome.	8. Identify the components of the lysosome.
9. Explain the process of osmosis.	9. Identify the components of the cell membrane.
10. Describe the structure and function of the vacuole.	10. Identify the components of the vacuole.

1. **analyze and represent the nature, structure, utility and key operations associated with dynamic abstract data types (ADTs) available in high-level programming languages**

- 1.1 list and explain the advantages and disadvantages of dynamic ADTs
- 1.2 describe the nature and structure of common and useful dynamic ADTs such as:
  - 1.2.1 lists
  - 1.2.2 stacks
  - 1.2.3 queues and priority queues
  - 1.2.4 sets
  - 1.2.5 maps
  - 1.2.6 trees
- 1.3 list and describe dynamic data structures used to implement dynamic ADTs including:
  - 1.3.1 user-created dynamic arrays and associative arrays
  - 1.3.2 user-created linear linked structures
  - 1.3.3 user-created hash tables
  - 1.3.4 specialized class libraries
- 1.4 list and describe common data operations associated with the dynamic data structures including:
  - 1.4.1 traversing the items in the data structure
  - 1.4.2 finding and/or retrieving an item
  - 1.4.3 adding, removing or replacing an item
  - 1.4.4 determining the size of the structure

- 1.4.5 determining if the structure is empty
- 1.4.6 providing a copy or subset of the collection
- 1.4.7 comparing or combining with other data structures of the same type
- 2. analyze and represent the nature, utility, approaches and nomenclature associated with the asymptotic analyses of algorithmic efficiency**
  - 2.1 describe asymptotic analysis
  - 2.2 explain the relationship between efficiency and complexity in the analysis of algorithms
  - 2.3 represent the efficiency and complexity of an algorithm using big O notation including:
    - 2.3.1 constant growth
    - 2.3.2 logarithmic growth
    - 2.3.3 linear growth
    - 2.3.4 linearithmic growth
    - 2.3.5 polynomial growth
    - 2.3.6 exponential growth
- 3. explain and demonstrate the rationale and use of recursive and introductory recursive operations**
  - 3.1 compare and contrast recursion with iteration
  - 3.2 evaluate and identify problems that require recursive processes
  - 3.3 describe and represent recursive program flow
- 4. analyze and represent the nature, architecture, operation and utility of a Turing machine**
  - 4.1 explain the nature and use of Turing machines
  - 4.2 represent a Turing machine
  - 4.3 demonstrate the ability to execute simple programs on a Turing machine
  - 4.4 create simple state representations
- 5. demonstrate an understanding of computer science's impact on society by preparing and delivering a presentation on a personally relevant area of interest where computer science intersects with society**
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals



## **COURSE CSE3110: ITERATIVE ALGORITHM 1**

**Level:** Advanced

**Prerequisite:** CSE2120: Data Structures 1

**Description:** Students learn a number of standard iterative data processing algorithms useful for working with data structures such as arrays. These include an iterative version of the binary search, the three basic sorts—exchange (bubble), insertion and selection, and a simple merge. In the process, they learn when and where to apply these algorithms.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials. Access to an object-oriented programming environment that encourages a formal treatment of objects.

**Supporting Courses:** CSE2130: Files & File Structures 1  
CSE3010: Computer Science 3  
CSE3120: Object-oriented Programming 1

**Outcomes:** The student will:

### **1. analyze and represent the nature, structure and utility of common iterative algorithms**

- 1.1 compare and contrast search, sort and merge algorithms
- 1.2 explain the way in which search, sort and merge algorithms manipulate data
- 1.3 describe the data structures required by search, sort and merge algorithms
- 1.4 describe how search, sort and merge algorithms are implemented in a programming environment
- 1.5 describe and represent iterative search algorithms including:
  - 1.5.1 linear search
  - 1.5.2 binary search
  - 1.5.3 compare and contrast how linear and binary searches manipulate data
  - 1.5.4 compare and contrast the data structures required and the computational efficiencies of linear and binary searches
- 1.6 describe and represent basic iterative sort algorithms including:
  - 1.6.1 exchange sort; e.g., bubble sort, cocktail sort, gnome sort, comb sort
  - 1.6.2 selection sort; e.g., selection sort, strand sort
  - 1.6.3 insertion sort; e.g., insertion sort, library sort
  - 1.6.4 comparing and contrasting how different classes of sorts manipulate data
  - 1.6.5 comparing and contrasting the data structures required and the computational efficiencies of different classes of sorts
- 1.7 describe and represent simple iterative merge algorithms

### **2. create and/or modify algorithms that use searches, sorts and merges to solve problems**

- 2.1 demonstrate the use of appropriate general design techniques for the programming environment being considered for implementation
- 2.2 analyze and decompose the problem into appropriate subsections using the decomposition techniques appropriate for the chosen design approach
- 2.3 evaluate subsections and identify any that may require some type of search, sort and/or merge algorithm, based on the nature of the data to be processed and the type of processing operations
- 2.4 identify which algorithms are appropriate or required to search, sort and/or merge data

- 2.5 sequence the various subsections appropriately
- 2.6 test and modify the developing algorithm with appropriate data using a “fail-on-paper” process
- 3. **create and/or modify programs that use searches, sorts and merges to solve problems**
  - 3.1 convert algorithms calling for standard iterative structures into programs that reflect the algorithm’s design
  - 3.2 use original (user-created) or pre-existing search, sort and/or merge algorithms appropriate to the data being manipulated
  - 3.3 utilize the appropriate operators, methods, functions or procedures required to carry out the standard algorithms
  - 3.4 use internal and external documentation
- 4. **compare program operation and outcomes with the intent of the algorithm and modify, as required**
  - 4.1 use appropriate error-trapping mechanisms built into the programming environment, as well as programmer-directed error-trapping techniques, to eliminate logic errors and debug the program
  - 4.2 compare the congruency between the outcomes of the debugged program and the original intent of the algorithm and modify both, as required
- 5. **demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. **create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE CSE3120: OBJECT-ORIENTED PROGRAMMING 1**

**Level:** Advanced

**Prerequisite:** CSE2110: Procedural Programming 1

**Description:** Students add to their understanding of programming paradigms by moving from a procedural programming approach, in which modularity is handled through subprograms, to an object-oriented approach, in which it is handled through objects. They learn a simple object-oriented analysis and design approach based on the use of object diagrams and write programs that use objects associated with one another in a client/server relationship.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials. Access to an object-oriented programming (OOP) environment that encourages a formal treatment of objects.

**Supporting Courses:** CSE3010: Computer Science 3  
CSE3110: Iterative Algorithm 1

**Outcomes:** The student will:

### **1. explain and represent the nature, rationale and key approaches associated with OOP**

- 1.1 describe the core concepts of OOP including:
  - 1.1.1 implementation by the exchange of “messages” among “objects”
  - 1.1.2 an outline of the key features of the OOP approach: e.g. encapsulation, modularity, polymorphism, inheritance
  - 1.1.3 use of private, public and protected members, accessors and modifiers to control access to data
  - 1.1.4 use of encapsulation and modularity when writing algorithms and programs
  - 1.1.5 use of classes and objects
  - 1.1.6 an outline the paradigm shift that occurred in the move from imperative and procedural programming to OOP
  - 1.1.7 the advantages of OOP over earlier paradigms
- 1.2 explain key differences between OOP and procedure-oriented programming in:
  - 1.2.1 designing programs
  - 1.2.2 the storage and access of data
  - 1.2.3 the maintenance of programs

### **2. demonstrate object-oriented design skills by writing algorithms employing an object-oriented approach to solving problems**

- 2.1 write algorithms and programs that deal with a small number of classes with an associative relationship
- 2.2 use an iterative and incremental approach in the analysis, design and development (architecture) stages of the software development process
- 2.3 apply an object-oriented design model to solve a data processing problem including:
  - 2.3.1 requirement analysis
  - 2.3.2 case analysis
  - 2.3.3 domain analysis



- 2.4 use an iterative and incremental approach to refine the architecture into appropriate class or object diagrams showing their relationships
- 2.5 analyze and refine the diagrams identifying the client/server relationship among the objects and determining the messages that need to be passed between objects and how the objects interface
- 2.6 draft an informal object message sequence indicating the flow of messages in the system
- 2.7 complete the object design by adding private methods, functions and data structures required to implement the various objects
- 2.8 test and modify, as required, the developing algorithm at each stage with appropriate data
- 3. translate algorithms into source code, convert the source code into machine executable form, execute and debug, as required**
  - 3.1 use iterative and incremental approaches in the implementation, testing and maintenance phases of the software development process
  - 3.2 break the algorithm into appropriate sections for implementation using a prototype approach
  - 3.3 create the classes necessary to instantiate the objects called for by the algorithm
  - 3.4 as the classes are constructed, use the server classes to create the client classes establishing the client/server relationships called for by the algorithm
  - 3.5 test and modify the sections, as required
  - 3.6 convert an algorithm into a program of linked classes, objects, instances and methods in a manner that reflects the structure of the algorithm using an iterative and incremental approach
  - 3.7 profile and optimize the code to add additional sections and/or features to the growing program
  - 3.8 where appropriate, collaborate with other students to carry out OOP tasks
  - 3.9 create internal and external documentation
  - 3.10 analyze the program and eliminate syntax, run-time and logic errors by using appropriate test data for each programming task at each stage of development
- 4. compare the results of the program with the intent of the algorithm and modify, as required**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE CSE3130: OBJECT-ORIENTED PROGRAMMING 2**

**Level:** Advanced

**Prerequisite:** CSE3120: Object-oriented Programming 1

**Description:** Students extend their knowledge of object-oriented programming (OOP). They add to their expertise in object-oriented design by using some of the techniques associated with the UML design approach and to their programming expertise by writing programs that explore association between classes. Students work with abstract classes, developing algorithms that employ the object diagram approach and programs that use templated classes, containment and inheritance to promote reusability.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials. Access to OOP environment that encourages a formal treatment of objects.

**Supporting Courses:** CSE3010: Computer Science 3  
CSE3110: Iterative Algorithm 1

**Outcomes:** The student will:

- 1. explain and represent class and object interactions possible in OOP**
  - 1.1 outline the key properties of the OOP approach
  - 1.2 describe and demonstrate how coding can be reduced and responsibilities distributed through the appropriate use of polymorphism and inheritance
  - 1.3 describe and represent the relationship among the classes, objects, instances and methods including:
    - 1.3.1 inheritance
    - 1.3.2 association
    - 1.3.3 composition and aggregation
  - 1.4 describe and represent ways in which inheritance and polymorphism are promoted
  - 1.5 outline how static classes, polymorphism and inheritance may be used to hide and/or protect data
- 2. demonstrate OOP skills by writing algorithms employing an object-oriented approach to solving problems**
  - 2.1 apply an object-oriented analysis and design model to decompose a data processing problem into a form that is accessible to an OOP approach by using:
    - 2.1.1 an informal domain analysis
    - 2.1.2 an informal use case analysis
    - 2.1.3 a general design model
  - 2.2 analyze a data processing problem and use a top-down design approach to transform a design model into a class diagram that represents the matrix of interacting classes required to solve the problem
  - 2.3 describe and represent the relationship among the classes; e.g., inheritance, association, aggregation, composition
  - 2.4 use an iterative and incremental approach to refine the architecture into appropriate class or object diagrams showing their relationships

- 2.5 analyze and refine the diagrams identifying the client/server relationship among the objects and determine the messages that need to be passed between objects and how the objects interface
- 2.6 draft an informal object message sequence indicating the flow of messages in the system
- 2.7 analyze and refine the object design by adding private methods, functions and data structures required to implement the various objects
- 2.8 test and modify, as required, the developing algorithm at each stage with appropriate data
- 3. translate algorithms into source code, convert the source code into machine executable form, execute and debug, as required**
  - 3.1 demonstrate the use iterative and incremental approaches in the implementation, testing and maintenance phases of the software development process
  - 3.2 demonstrate the use of iterative prototyping or a similar approach to break the algorithm into appropriate sections for implementation
  - 3.3 use original (user-created) or pre-existing classes, as necessary, to instantiate the objects called for by the algorithm using an iterative and incremental approach
  - 3.4 as the classes are constructed, use the server classes to create the client classes establishing the client/server relationships called for by the algorithm
  - 3.5 test and modify the sections as required
  - 3.6 where appropriate, collaborate with other students to carry out OOP tasks
  - 3.7 create internal and external documentation
  - 3.8 analyze the program and eliminate syntax, run-time and logic errors by using appropriate test data for each programming task at each stage of development
- 4. compare the results of the program with the intent of the algorithm and modify, as required**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE CSE3140: SECOND LANGUAGE PROGRAMMING 2**

**Level:** Advanced

**Prerequisite:** CSE2120: Data Structures 1

**Description:** Designed for students who have mastered procedural programming and static data structures in a more accessible programming environment, this course gives students the opportunity to develop a similar skill set in a more demanding language.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials. Access to a programming environment that allows structured and modular programming.

**Supporting Courses:** CSE3010: Computer Science 3  
CSE3110: Iterative Algorithms or any  
Advanced project course involving structured and modular programming

**Outcomes:** The student will:

- 1. compare and contrast a new language with a previously learned language**
  - 1.1 consider the programming paradigms supported by each language including:
    - 1.1.1 list and describe the paradigms
    - 1.1.2 outline the advantages and disadvantages of the paradigms
  - 1.2 consider the source code to machine code translation process used by each language including:
    - 1.2.1 identify and describe the process used by each language
    - 1.2.2 outline the advantages and disadvantages of translation processes in each language
  - 1.3 consider the language characteristics including:
    - 1.3.1 language level; e.g., low, high, very high
    - 1.3.2 level of type; e.g., strongly typed, weakly typed
    - 1.3.3 nature of the source code; e.g., iconic, widgets, graphical
    - 1.3.4 difficulty to construct source code
    - 1.3.5 programming resources and aids
  - 1.4 consider the modular characteristics of each language including:
    - 1.4.1 types of subprograms supported
    - 1.4.2 how modularity is supported
    - 1.4.3 level of module cohesion possible
    - 1.4.4 amount of module coupling required
    - 1.4.5 object-oriented features
  - 1.5 other pertinent characteristics
- 2. demonstrate programming skills by writing algorithms for a second language that uses fundamental data structures**
  - 2.1 use appropriate general design techniques for a specific programming environment
  - 2.2 analyze and decompose the problem into appropriate subsections using techniques appropriate for the chosen design approach
  - 2.3 evaluate subsections and identify any that may require some type of fundamental data structure, based on the nature of the data to be processed and the type of processing operations



- 2.4 identify, use or construct the appropriate data structure; e.g., array using appropriate variant or variants, where required
- 2.5 identify and sequence the operations required to process the data to be contained in the data structure
- 2.6 sequence the various subsections appropriately
- 2.7 create more detailed algorithms for each module identifying the pre- and post-conditions and required program control of flow mechanisms
- 2.8 test and modify the algorithm using appropriate “fail-on-paper” techniques
- 3. demonstrate coding skills by translating algorithms that require fundamental data structures into a second language**
  - 3.1 convert an algorithm into a program of linked subprograms with a main or client module calling other modules in a manner that reflects the structure of the algorithm
  - 3.2 use appropriate types of subprograms to implement the various sections of the algorithm
  - 3.3 analyze and determine, in a second language, the type of scope required to protect and/or hide data and keep implementation decoupled from the calling modules and to avoid unwanted side effects with consideration of the:
    - 3.3.1 use of appropriate parameters for importing and exporting data to and from the subprograms
    - 3.3.2 use of local variables and nested subprograms to enhance cohesion
  - 3.4 analyze for, and maintain, an appropriate balance between the coupling or dependency and cohesion or focus of the subprograms
  - 3.5 create internal and external documentation
  - 3.6 analyze the program and eliminate syntax, run-time and logic errors by using appropriate test data for each programming task at each stage of development
- 4. compare the results of the program with the intent of the algorithm and modify, as required**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE CSE3210: SERVER-SIDE SCRIPTING 1**

**Level:** Advanced

**Prerequisites:** CSE2210: Client-side Scripting 3  
CSE2110: Procedural Programming 1  
CSE2120: Data Structures 1

**Description:** Students add to their ability to craft dynamic Web sites by exploring the fundamentals of server-side scripting. In the process, they add to their understanding of Internet scripting by employing databases as a repository for the information to be displayed by their sites. Students learn how to analyze, modify, write and debug algorithms and server-side scripts that use simple databases.

**Parameters:** Access to appropriate computer equipment, software, support materials and the Internet. Specifically, students must have access to a scripting environment that includes access to a Web server, a database management system and a server-side scripting language.

**Supporting Courses:** CSE3010: Computer Science 3  
CSE3110: Iterative Algorithm 1  
CSE3120: Object-oriented Programming 1 and/or any  
Advanced project course involving object-oriented programming

**Outcomes:** The student will:

- 1. demonstrate an understanding of the key features of server-side environments and server-side scripting**
  - 1.1 compare and contrast server-side scripting with dynamic client-side scripting including:
    - 1.1.1 outline the limitations of dynamic client-side scripting including security and quality of experience issues
    - 1.1.2 outline the advantages of server-side scripting including broader features available, developer control of application environment, greater interactivity, scalability and maintainability
    - 1.1.3 outline the disadvantages of server-side scripting
    - 1.1.4 describe how client-side and server-side scripting can and should be used to complement one another
    - 1.1.5 describe two Web applications made possible by server-side scripting approaches
    - 1.1.6 describe a server-side language and compare it with one or more client-side languages
  - 1.2 describe the system architecture of a typical server-side environment including:
    - 1.2.1 describe and represent the multitiered nature of a typical server-side environment
    - 1.2.2 describe the role played and capabilities needed by Web server software in a typical server-side environment
    - 1.2.3 describe the role played and capabilities needed by database and/or other information managers in a typical server-side environment
    - 1.2.4 describe the role played by the server-side scripting language in a typical server-side environment
    - 1.2.5 represent how a request from a client would be handled in a typical multitiered server-side environment

- 2. describe the processes and characteristics of a server-side environment**
  - 2.1 describe the various tiers that make up an environment including:
    - 2.1.1 identify the Web server software used in an environment and describe the role(s) it/they will be required to play
    - 2.1.2 identify the database manager and/or other information managers used in an environment and describe the role(s) it/they will be required to play
    - 2.1.3 identify the server-side scripting language(s) used in an environment and describe the role(s) it/they will be required to play
    - 2.1.4 identify and describe at least one significant task or application that a server-side environment could be used to carry out
- 3. use appropriate techniques to design applications for use in a server-side scripting environment**
  - 3.1 outline the intent of the application and determine if that intent can be advantageously realized through the use of a server-side environment including:
    - 3.1.1 determine the data handling requirements of the application, and determine if the application and information tiers of an environment are capable of handling those requirements
    - 3.1.2 determine the input/output requirements of the application, and determine if the client tier of an environment is capable of handling those requirements
  - 3.2 use an appropriate design technique to write the necessary algorithm(s) including:
    - 3.2.1 use an appropriate technique to represent the relationship among the modules
    - 3.2.2 write more detailed algorithms for each module and identify the pre- and post-conditions and program control of flow mechanisms required for any subprograms
  - 3.3 test the developing algorithm with appropriate data using a “fail-on-paper” process
  - 3.4 revise the algorithm, as required
- 4. write and debug the scripts required to implement a server-side application**
  - 4.1 demonstrate the ability to use an appropriate server-side scripting language environment
  - 4.2 convert the algorithms into scripts consisting of collaborating modules that reflect the structure of the algorithm including:
    - 4.2.1 use appropriate subprograms and/or objects to implement the various sections of the algorithm
    - 4.2.2 maintain an appropriate balance between the coupling or dependency and cohesion or focus of the modules
    - 4.2.3 pass data between the modules without unintended side-effects
    - 4.2.4 use internal and external documentation
  - 4.3 execute the script, and track and eradicate errors
  - 4.4 compare the results of the script’s execution with the intent of the algorithm and modify, as required
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely

- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals





## **COURSE CSE3240: ROBOTICS PROGRAMMING 3**

**Level:** Advanced

**Prerequisites:** CSE2240: Robotics Programming 2  
CSE2110: Procedural Programming 1

**Description:** Students continue their work in robotics programming by adding object-oriented programming (OOP) approaches to their skill set. In the process, they learn how to adapt their older procedure-based approaches to an object-oriented approach. They learn how to use object-oriented design approaches to design and write programs that use objects associated with one another in a client/server relationship.

**Parameters:** Access to appropriate computer equipment, software, support materials and the Internet. More specifically, students must have access to either the physical (real) or virtual (simulated) robotic environments they will require to design, write and debug Robot Control Language (RCL) scripts or programs.

**Supporting Courses:** CSE3010: Computer Science 3  
CSE3110: Iterative Algorithm 1  
CSE3120: Object-oriented Programming 1  
ELT3150: Robotics 3  
ELT3180: Robotics Vision Systems  
ELT3190: Robotics Kinematics & Behaviour  
ELT3200: Robotics Artificial Intelligence

**Outcomes:** The student will:

- 1. demonstrate an understanding of basic OOP approaches and how they can be used in robotics**
  - 1.1 demonstrate an understanding of:
    - 1.1.1 classes and objects that can be readily mapped to specific subsections of a robot's architecture
    - 1.1.2 class hierarchies to decompose complex robotic tasks into subtasks improving both the maintainability and extendibility of the programs
    - 1.1.3 potential code reuse both in the same and in other robotics programs
    - 1.1.4 the promotion of data hiding and information protection in robotics programs
    - 1.1.5 enhanced readability of robotics programs
    - 1.1.6 reduced side effect errors
- 2. demonstrate an understanding of basic OOP approaches and how they can be used to create class libraries**
  - 2.1 demonstrate how they:
    - 2.1.1 have the potential to improve design, coding and debugging efficiencies through the reduction of time spent and errors generated
    - 2.1.2 facilitate the development of higher levels of robotic artificial intelligence leading to programs that display greater agency and/or autonomy

- 3. design a robotics system consisting of at least one robot, associated control systems and environment that uses OOP approaches to carry out a set of predetermined tasks**
  - 3.1 describe and diagram the environment in which the robot will be required to operate by:
    - 3.1.1 identifying the elements in the environment that are to be manipulated by the robot and determining their location
    - 3.1.2 identifying the elements in the environment to be detected by the robot's sensors and determining their location
    - 3.1.3 determining the type and location of internal barriers in the environment
    - 3.1.4 setting the outer limits of the environment
  - 3.2 identify the general tasks the robot will be required to carry out including:
    - 3.2.1 use an appropriate object-oriented approach to break those tasks into simpler tasks, grouping them into sets of related behaviours and sequencing those behaviours, where appropriate
    - 3.2.2 draft a conceptual model of the robot's behaviour that reflects the task behaviours the robot will be expected to carry out
  - 3.3 identify the capabilities the robot will require to carry out the tasks
  - 3.4 determine the control approach to be used including what level of operator control will be required if the robot cannot support a fully autonomous mode of operation
  - 3.5 design the robot using the tasks to be accomplished, proposed environment, required capabilities and control approach as parameters
  - 3.6 check your design for congruency against the task list to be accomplished and with the proposed environmental specifications
  - 3.7 modify the design, as required
  - 3.8 carry out the design process sequentially using the iterative and incremental approaches associated with object-oriented design and development
- 4. use an OOP approach to build the environment, robot and controlling mechanism called for by the design**
  - 4.1 construct that portion of the environment required for the first task or tasks on the task sequence
  - 4.2 assemble as much of the robot, as is required, to accomplish those tasks
  - 4.3 write algorithms that use OOP approaches to outline how the first set of tasks is to be accomplished including:
    - 4.3.1 create a general design that reflects the robot's knowledge of the domain, allows for the acceptance of required data (sense), uses that data in conjunction with the domain model to arrive at decisions (plan) and provides the ability to act (action) to carry out the tasks
    - 4.3.2 use an incremental and stepwise approach to refine the design into a more concrete form such as a set of class or object diagrams showing the key objects and their relationship
    - 4.3.3 refine the design identifying the client/server relationship among the objects and determining the nature of the data or messages that need to be passed between objects
    - 4.3.4 design the objects' interface; e.g., public methods or functions to accommodate the data or messages that need to be passed between objects
    - 4.3.5 draft an informal sequence indicating the flow of messages in the system
    - 4.3.6 complete the object design by adding the private methods, functions and data structures required to implement the various objects
    - 4.3.7 use appropriate techniques to determine if the algorithm will achieve the original intent
  - 4.4 use an object-oriented RCL to translate the algorithms into a program including:
    - 4.4.1 use a technique such as iterative prototyping to break the algorithm or design into functional units or modules that can be encoded using object-oriented approaches
    - 4.4.2 deal with each section; in turn, create the classes necessary to instantiate the objects called for by the design using built-in and other available class libraries, where possible

- 4.4.3 establish the client/server relationships among the classes, as called for by the design, being sure to maintain appropriate access levels to ensure cooperation while preserving boundaries
  - 4.4.4 pass data between the subprograms without unintended side effects and modify the sections, as required
  - 4.4.5 use internal and external documentation
  - 4.5 load and execute the program, and track and eradicate errors including:
    - 4.5.1 test each of the physical subsystems of the robot(s) to eliminate engineering errors
    - 4.5.2 test the robot(s) within the appropriate section of the environment to confirm that the robot is interacting with the environment as called for by the algorithm
    - 4.5.3 use self-test code and check points in each module, as well as observation, to eliminate run-time and internal logic errors
    - 4.5.4 compare the robot's actions with the intent of the algorithm
    - 4.5.5 modify the original task list, environment, algorithm and/or program, as required
  - 4.6 participate in intermittent critiques throughout the iterative process; e.g., planning, analysis, design, testing, evaluation
- 5. demonstrate basic competencies**
- 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
- 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals





## **COURSE CSE3310: RECURSIVE ALGORITHMS 1**

**Level:** Advanced

**Prerequisites:** CSE3110: Iterative Algorithm 1  
CSE3120: Object-oriented Programming 1

**Description:** Students learn how to use a new program control flow mechanism called recursion. They then use this mechanism to write a number of basic recursive algorithms and programs such as a recursive version of the binary search, the quicksort and the merge sort.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials. Access to an object-oriented programming environment that encourages a formal treatment of objects.

**Supporting Courses:** CSE3020: Computer Science 4  
CSE3130: Object-oriented Programming 2

**Outcomes:** The student will:

- 1. analyze and represent the nature and utility of the recursive functions or procedures**
  - 1.1 explain and represent the key features of recursive algorithms including:
    - 1.1.1 illustrate how recursive algorithms define themselves in terms of themselves
    - 1.1.2 illustrate the use and purpose of the base case in recursion
  - 1.2 describe and represent the “divide and conquer” approach to creating recursive algorithms
  - 1.3 describe and represent the interchangeability of recursive and iterative operations
  - 1.4 compare and contrast recursion and iteration highlighting:
    - 1.4.1 programmer efficiency
    - 1.4.2 space efficiency
    - 1.4.3 time efficiency
  - 1.5 outline the importance of recursion in creating dynamic data structures
  - 1.6 compare and contrast tail end and head end recursion
  - 1.7 explain and represent how the system stack (or equivalent structure) is used to carry out recursive operations
- 2. analyze and represent the nature, structure and utility of recursive search and sort algorithms**
  - 2.1 describe at least four recursive algorithms used in dynamic data manipulation
  - 2.2 compare and contrast iterative and recursive approaches to binary searching by:
    - 2.2.1 describing and representing iterative and recursive binary search algorithms
    - 2.2.2 explaining the advantages and disadvantages of iterative and recursive approaches to binary searching
  - 2.3 compare and contrast at least two recursive sorts by:
    - 2.3.1 describing and representing the quicksort and the merge sort
    - 2.3.2 describing and representing the heapsort
    - 2.3.3 explaining the advantages and disadvantages of the quicksort, merge sort and heapsort

- 3. create and/or modify recursive algorithms to solve problems**
  - 3.1 demonstrate the use of appropriate general design techniques to draft algorithms that use recursion
  - 3.2 analyze and decompose the problem into appropriate subsections using the decomposition techniques appropriate for the chosen design approach
  - 3.3 evaluate subsections and identify any that may require a recursive approach
  - 3.4 identify which recursive algorithms are appropriate
  - 3.5 sequence the various subsections appropriately
  - 3.6 test and modify the developing algorithm with appropriate data using a “fail-on-paper” process
- 4. create and/or modify programs that use recursion**
  - 4.1 convert algorithms calling for recursive structures into programs that reflect the algorithm’s design
  - 4.2 use original (user-created) or pre-existing recursive merge and/or sort algorithms appropriate to the data being manipulated
  - 4.3 utilize the appropriate operators, methods, functions or procedures required to carry out the recursive algorithms
  - 4.4 use internal and external documentation
- 5. compare program operation and outcomes with the intent of the algorithm and modify, as required**
  - 5.1 use appropriate error-trapping mechanisms built into the programming environment, as well as programmer-directed error-trapping techniques, to eliminate logic errors and debug the program
  - 5.2 compare the congruency between the outcomes of the debugged program and the original intent of the algorithm and modify both, as required
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE CSE3320: DYNAMIC DATA STRUCTURES 1**

**Level:** Advanced

**Prerequisite:** CSE3310: Recursive Algorithms 1

**Description:** Students learn how to design, code and debug programs using abstract data types that utilize dynamic data structures. Students explore dynamic memory allocation, in general, and as handled by their programming environment. Students concentrate on how the linked list dynamic data structure(s) can be used to implement abstract data types.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials. Access to an object-oriented programming environment that encourages a formal treatment of objects.

**Supporting Courses:** CSE3020: Computer Science 4  
CSE3130: Object-oriented Programming 2

**Outcomes:** The student will:

### **1. analyze and represent the nature, structure and utility of linked lists**

- 1.1 describe and represent the nature of dynamic data structures including:
  - 1.1.1 the mechanics of dynamic memory allocation; e.g., the heap, pointers and/or references, linear and non-linear data structures
  - 1.1.2 a comparison and contrast of dynamic and static data structures
- 1.2 describe and represent the nature and mechanics of linked lists by:
  - 1.2.1 describing linked lists as a components of abstract data types
  - 1.2.2 describing the logical structure of the singly linear linked list including nodes, fields, references and pointers
  - 1.2.3 describing the logical structure of other types of linked lists; e.g., double-linked, circularly-linked, ordered linked lists
- 1.3 describe and represent the operators associated with linked lists by:
  - 1.3.1 creating the linked list
  - 1.3.2 inserting a node
  - 1.3.3 traversing the linked list
  - 1.3.4 deleting a node
  - 1.3.5 replacing a node
  - 1.3.6 finding and retrieving data from the linked list
  - 1.3.7 determining the size of the linked list
- 1.4 explain the advantages of the linked list over static data structures

### **2. create and/or modify algorithms that use linked lists to solve problems**

- 2.1 demonstrate the use of appropriate general design techniques to draft algorithms that use linked lists
- 2.2 analyze and decompose the problem into appropriate subsections using the decomposition techniques appropriate for the chosen design approach
- 2.3 evaluate subsections and identify any that may require some dynamic data structures, based on the nature of the data to be processed and type of processing operations
- 2.4 identify which dynamic data structures are appropriate or required to merge and/or sort data

- 2.5 sequence the various subsections appropriately
- 2.6 test and modify the developing algorithm with appropriate data using a “fail-on-paper” process
- 3. create and/or modify programs based on appropriate algorithms that make effective use of linked lists**
  - 3.1 convert algorithms calling for dynamic data structures into programs that reflect the algorithm’s design
  - 3.2 use original (user-created) or pre-existing dynamic data structures appropriate to the data being manipulated
  - 3.3 utilize the appropriate operators, methods, functions or procedures required to use dynamic data structures
  - 3.4 use internal and external documentation
- 4. compare program operation and outcomes with the intent of the algorithm and modify, as required**
  - 4.1 use appropriate error-trapping mechanisms built into the programming environment, as well as programmer-directed error-trapping techniques, to eliminate logic errors and debug the program
  - 4.2 compare the congruency between the outcomes of the debugged program and the original intent of the algorithm and modify both, as required
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE CSE3330: DYNAMIC DATA STRUCTURES 2**

**Level:** Advanced

**Prerequisite:** CSE3320: Dynamic Data Structures 1

**Description:** Students enhance their knowledge of abstract data types that utilize dynamic data structures by expanding their repertoire to include stacks and queues. Students also study the unordered data structures, set and map, and learn how to incorporate them into abstract data types. As part of this work, they learn how to use linked lists to create stacks and queues.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials. Access to an object-oriented programming environment that encourages a formal treatment of objects.

**Supporting Courses:** CSE3020: Computer Science 4  
CSE3130: Object-oriented Programming 2 and/or any  
Advanced project course involving the use of abstract data types

**Outcomes:** The student will:

- 1. analyze and represent the nature, structure and utility of stacks, queues, sets and/or maps**
  - 1.1 explain and represent the nature and mechanics of stacks, queues, sets and/or maps including:
    - 1.1.1 the role of stacks, queues, sets and/or maps as containers for abstract data types (ADTs)
    - 1.1.2 the abstract data type and data manipulation each structure is best suited to
    - 1.1.3 the logical structure of stacks, queues, sets and/or maps
  - 1.2 explain and represent the standard operators associated with stacks, queues, sets and/or maps including:
    - 1.2.1 create the data structure
    - 1.2.2 copy the data structure; e.g., cloning, deep copy
    - 1.2.3 push, pop and peek for stacks
    - 1.2.4 enqueue and dequeue for queues
    - 1.2.5 link keys and values for maps
    - 1.2.6 search, insert, remove and modify data elements in sets and/or maps
    - 1.2.7 determine equality between sets
    - 1.2.8 determine union, intersection, difference and symmetric difference
    - 1.2.9 delete the data structure
  - 1.3 explain the advantages and disadvantages of using stacks, queues, sets and/or maps
- 2. create and/or modify algorithms using stacks, queues, sets and/or maps to solve problems**
  - 2.1 demonstrate the use of appropriate general design techniques to draft algorithms that use stacks, queues, sets and/or maps
  - 2.2 analyze and decompose the problem into appropriate subsections using the decomposition techniques appropriate for the chosen design approach
  - 2.3 evaluate subsections and identify any that may require stacks, queues, sets and/or maps, based on the nature of the data to be processed and type of processing operations
  - 2.4 identify which structures (stacks, queues, sets and/or maps) are appropriate or required to manipulate data

**3. create and/or modify programs based on appropriate algorithms that use various tree data structures**

- 3.1 convert algorithms calling for tree data structures into programs that reflect the algorithm's design
- 3.2 use original (user-created) or pre-existing tree data structures appropriate to the data being manipulated
- 3.3 utilize the appropriate operators, methods, functions or procedures required to use tree data structures
- 3.4 use internal and external documentation

**4. compare program operation and outcomes with the intent of the algorithm and modify, as required**

- 4.1 use appropriate error-trapping mechanisms built into the programming environment, as well as programmer-directed error-trapping techniques, to eliminate logic errors and debug the program
- 4.2 compare the congruency between the outcomes of the debugged program and the original intent of the algorithm and modify both, as required

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals

**COURSE CSE3910: CSE PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals



**COURSE CSE3920: CSE PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

- 1. identify the two or more CTS courses being linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance by:
    - 2.1.1 preparing a plan
    - 2.1.2 clarifying the purposes
    - 2.1.3 defining the deliverables
    - 2.1.4 specifying time lines
    - 2.1.5 explaining terminology, tools and processes
    - 2.1.6 defining resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

**4.1 demonstrate fundamental skills to:**

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

**4.2 demonstrate personal management skills to:**

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

**4.3 demonstrate teamwork skills to:**

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

**5.1 identify short-term and long-term goals**

**5.2 identify steps to achieve goals**

**COURSE ENT1010: CHALLENGE & OPPORTUNITY**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students identify, compare and assess a variety of venture opportunities and ideas.

**Parameters:** No specialized equipment or facilities.

**Outcomes:** The student will:

- 1. recognize and assess venture opportunities in their environment**
  - 1.1 compile a list of opportunities; e.g., needs, wants, problems
  - 1.2 describe and apply a decision-making model for potential entrepreneurial opportunities
  - 1.3 demonstrate skills in problem solving and decision making
- 2. generate ideas for possible venture opportunities in their environment**
  - 2.1 demonstrate skills in generating ideas, alternatives and strategies
  - 2.2 outline conditions needed to promote idea generation and change initiation
  - 2.3 explain “failure of a business venture” as an opportunity to learn
  - 2.4 show sensitivity and respect for the perspectives, needs, wants and priorities of others
  - 2.5 demonstrate characteristics of creative thinking
- 3. plan a venture**
  - 3.1 identify various means of entering business including:
    - 3.1.1 start a new business
    - 3.1.2 purchase a business
    - 3.1.3 purchase a franchise
    - 3.1.4 multilevel marketing
  - 3.2 analyze common forms of business ownership including:
    - 3.2.1 sole proprietorship
    - 3.2.2 partnership
    - 3.2.3 corporation
    - 3.2.4 franchise
    - 3.2.5 cooperative
    - 3.2.6 conglomerate
    - 3.2.7 multinational
    - 3.2.8 crown corporation
  - 3.3 identify non-profit ventures; e.g., community organizations
  - 3.4 describe briefly the process of creating a venture plan including:
    - 3.4.1 rationale
    - 3.4.2 goals/objectives
    - 3.4.3 research
    - 3.4.4 resources
    - 3.4.5 market analysis
    - 3.4.6 risk assessment
    - 3.4.7 financial analysis
    - 3.4.8 success strategy

- 3.5 describe the important components of a venture plan including:
  - 3.5.1 description/objectives
  - 3.5.2 market research and analysis
  - 3.5.3 marketing plan
  - 3.5.4 production/service plan
  - 3.5.5 financial plan
  - 3.5.6 human resources/organizational plan
- 3.6 describe regulations and social responsibilities that limit venture alternatives; e.g., legal, social, ethical, environmental, cultural, political, economic
- 4. assess a venture**
  - 4.1 describe criteria for assessing the feasibility of ideas and strategies
  - 4.2 apply feasibility criteria to venture alternatives
  - 4.3 prepare a feasibility analysis of a venture idea including:
    - 4.3.1 a brief description
    - 4.3.2 objectives
    - 4.3.3 resources required to achieve objectives
    - 4.3.4 time lines
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices



## **COURSE ENT1020:       ELEMENTS OF A VENTURE PLAN**

**Level:**                           Introductory

**Prerequisite:**               None

**Description:**               Students learn the elements of a venture planning process.

**Parameters:**               No specialized equipment or facilities.

**Outcomes:**                 The student will:

- 1. demonstrate goal-setting and problem-solving strategies that facilitate change**
  - 1.1 identify short-term and long-term goals for the selected venture
  - 1.2 create a mission statement for the venture
  - 1.3 describe operational policies consistent with the venture philosophy and business ethics
  - 1.4 research legal obligations that affect the venture
  - 1.5 outline a human resources plan
  - 1.6 establish a support network including:
    - 1.6.1 locating and designing potential support networks
    - 1.6.2 proposing strategies for securing and effectively using sources of support
- 2. describe potential risks and propose strategies for assessing risks related to a venture**
  - 2.1 analyze the types of potential risks including:
    - 2.1.1 physical
    - 2.1.2 financial
    - 2.1.3 human resources
  - 2.2 complete a risk assessment
  - 2.3 propose strategies to assess and minimize risk
- 3. describe strategies for securing resources and support required to implement a venture**
  - 3.1 analyze potential markets including:
    - 3.1.1 local
    - 3.1.2 regional
    - 3.1.3 national
    - 3.1.4 international/global
  - 3.2 relate market projections to trends and forecasts
  - 3.3 evaluate potential competition
  - 3.4 outline venture needs regarding the:
    - 3.4.1 target market
    - 3.4.2 product/service
    - 3.4.3 pricing
    - 3.4.4 location
  - 3.5 research and appraise potential changes in the market
- 4. select, plan and assess a venture**
  - 4.1 complete a venture plan including:
    - 4.1.1 purpose
    - 4.1.2 description/objectives
    - 4.1.3 market research and analysis
    - 4.1.4 marketing plan
    - 4.1.5 production/service plan

- 4.1.6 financial plan
- 4.1.7 human resources/organizational plan
- 4.2 analyze the venture plan and revise, as necessary
- 4.3 research various presentation techniques
- 4.4 present the venture plan
- 4.5 analyze and evaluate the outcome of the presentation
- 4.6 evaluate criteria used by other individuals and groups for a successful venture
- 4.7 evaluate the strengths and weaknesses of the venture
- 4.8 prepare a written critique assessing the venture
- 5. demonstrate qualities that initiate change**
  - 5.1 demonstrate initiative
  - 5.2 demonstrate flexibility
  - 5.3 demonstrate leadership/teamwork by:
    - 5.3.1 analyzing leadership styles
    - 5.3.2 evaluating leadership styles and their appropriateness to the success of the venture
  - 5.4 demonstrate skills
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 7.2 create a connection between a personal inventory and occupational choices

## **COURSE ENT1910: ENT PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

#### **1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

#### **2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

#### **3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices



**COURSE ENT2010: ANALYZING VENTURES**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students gather and analyze data to make informed decisions about the feasibility of ventures.

**Parameters:** No specialized equipment or facilities.

**Outcomes:** The student will:

**1. describe and apply various methods for analyzing and evaluating ventures**

**1.1 describe various methods for analyzing and evaluating ventures including:**

- 1.1.1 personal criteria
- 1.1.2 market analysis; e.g., provide results of market research, collecting both primary and secondary data, and indicate the advantages and disadvantages of each
- 1.1.3 industry analysis
- 1.1.4 financial analysis; describe the following potential risks involved in ventures: financial, personal, legal, societal, environmental
- 1.1.5 financial plan/projection; analyze various ventures or case studies through an analysis of such aspects as: working capital/cash flow, operating expenses, financial ratios, profitability
- 1.1.6 human resources analysis
- 1.1.7 product/service evaluation; analyze and compare ventures in terms of: personal criteria, human resources, production, managing, marketing, distribution, technical feasibility, general acceptance, competition, legalities

**2. describe criteria important to the success of various ventures**

**2.1 describe the success of various ventures in terms of:**

- 2.1.1 personal criteria
- 2.1.2 effectiveness of human resources
- 2.1.3 customer benefits
- 2.1.4 ability to raise capital
- 2.1.5 return on investment
- 2.1.6 growth potential
- 2.1.7 technical feasibility
- 2.1.8 simplicity of manufacturing
- 2.1.9 ease of operation
- 2.1.10 quality of product/service
- 2.1.11 marketability
- 2.1.12 size of market
- 2.1.13 advertising potential

**2.2 outline various primary data collection methods including:**

- 2.2.1 observation
- 2.2.2 surveys
- 2.2.3 questionnaires

- 2.3 identify sources of secondary data including:
  - 2.3.1 libraries; e.g., school, public, government
  - 2.3.2 associations; e.g., business, professional
  - 2.3.3 journals; e.g., trade, business, professional
  - 2.3.4 publications; e.g., federal, provincial, municipal
- 2.4 compare various venture plans in terms of:
  - 2.4.1 market analyses
  - 2.4.2 operating plans
  - 2.4.3 financial plans
- 3. analyze research, compare a variety of ventures and make informed decisions about the feasibility of each venture**
  - 3.1 use the data presented and evaluate the strengths and weaknesses of each venture
  - 3.2 select the most feasible venture based on the analyzed data
  - 3.3 prepare a written critique, including an in-depth analysis and assessment of a venture
  - 3.4 compare various venture plans in terms of:
    - 3.4.1 market analyses
    - 3.4.2 operating plans
    - 3.4.3 financial plan
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ENT2020: FINANCING VENTURES**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students compare various sources of financing and choose the method that is best for financing the venture.

**Parameters:** No specialized equipment or facilities.

**Supporting Course:** ENT1010: Challenge & Opportunity

**Outcomes:** The student will:

### **1. identify the advantages and disadvantages of financial options**

- 1.1 analyze various sources of equity capital including:
  - 1.1.1 personal capital; e.g., self, family, friends
  - 1.1.2 venture capital; e.g., venture capitalists, business “angels”
  - 1.1.3 partnerships
  - 1.1.4 shares
  - 1.1.5 stocks/bonds
- 1.2 analyze various sources of debt financing including:
  - 1.2.1 personal savings
  - 1.2.2 family/friends
  - 1.2.3 financial institutions; e.g., banks, credit unions, trust companies, government organizations
  - 1.2.4 loan sharks
  - 1.2.5 debentures
  - 1.2.6 mortgages
- 1.3 research and evaluate various financial options in terms of:
  - 1.3.1 advantages/disadvantages
  - 1.3.2 inherent risks
  - 1.3.3 costs
  - 1.3.4 stresses
  - 1.3.5 relationships
  - 1.3.6 decision-making power
- 1.4 select the financial alternatives that best meet the needs of the venture

### **2. describe various sources of financing for ventures**

- 2.1 compare and contrast equity capital and debt financing
- 2.2 categorize given examples of equity capital and debt financing
- 2.3 explain other terms relevant to financing ventures
- 2.4 describe sources of equity capital and debt financing within the local community
- 2.5 describe other sources of financing and assistance including:
  - 2.5.1 suppliers
  - 2.5.2 memberships
  - 2.5.3 fundraising
  - 2.5.4 sales
  - 2.5.5 societies

2.5.6 foundations

2.5.7 government

**3. demonstrate the differences between short- and long-term financing**

3.1 identify financial needs at various stages of ventures

3.2 distinguish between fixed and variable costs

3.3 explain a “break-even analysis” for ventures

3.4 distinguish between short- and long-term financing

3.5 prepare a sample cash flow

**4. demonstrate the process of applying for different types of financing**

4.1 locate, compile and complete loan applications with local financial institutions

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

5.1.1 communicate

5.1.2 manage information

5.1.3 use numbers

5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

5.2.1 demonstrate positive attitudes and behaviours

5.2.2 be responsible

5.2.3 be adaptable

5.2.4 learn continuously

5.2.5 work safely

5.3 demonstrate teamwork skills to:

5.3.1 work with others

5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

6.1 recognize and then analyze the opportunities and barriers in the immediate environment

6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE ENT2030:      MARKETING THE VENTURE**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students appraise various marketing strategies and formulate a marketing strategy for a venture.

**Parameters:** No specialized equipment or facilities.

**Outcomes:** The student will:

**1. describe various marketing strategies in terms of their suitability in reaching the target market for the venture**

- 1.1 differentiate between primary and secondary data
- 1.2 conduct basic marketing research from the following sources in order to identify the primary target customer:
  - 1.2.1 primary sources; e.g., observing, interviewing potential customers
  - 1.2.2 secondary sources; e.g., trade magazines, news articles, the Yellow Pages, Statistics Canada
- 1.3 describe the primary target customer for the venture in terms of:
  - 1.3.1 psychographics; e.g., lifestyle, buying habits, attitudes, opinions
  - 1.3.2 demographics; e.g., education level, income, age
  - 1.3.3 geographic; e.g., geographic area
- 1.4 use statistical information to identify the number of potential customers within the marketing area
- 1.5 analyze the following particular ventures in terms of the marketing mix:
  - 1.5.1 product service characteristics; e.g., unique selling points
  - 1.5.2 pricing
  - 1.5.3 distribution channels
  - 1.5.4 promotion

**2. describe and implement a marketing strategy for a particular venture**

- 2.1 apply the concept of marketing to a particular venture
- 2.2 analyze the relationship between marketing and other venture decisions
- 2.3 describe the decisions that must be made when completing a marketing plan
- 2.4 research sources of assistance and information and create a support network

**3. identify the strengths and weaknesses of the marketing strategy and revise the strategy, as necessary**

- 3.1 identify various marketing strategies for their applicability in terms of marketing mix for a target market
- 3.2 justify the importance of a marketing program for the venture including:
  - 3.2.1 economic
  - 3.2.2 social
  - 3.2.3 business
- 3.3 compare the various techniques of promotion such as:
  - 3.3.1 advertising
  - 3.3.2 personal selling
  - 3.3.3 free publicity

- 3.3.4 sales promotion
- 3.3.5 merchandising
- 3.3.6 trade shows
- 3.4 analyze cost-benefit factors in the selection of alternative marketing strategies
- 3.5 devise a promotional strategy, within a predetermined budget, for the particular venture
- 3.6 evaluate the strengths and weaknesses of the marketing strategy and revise, as necessary
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ENT2040:      CREATE THE VENTURE**

<b>Level:</b>	Intermediate
<b>Prerequisite:</b>	None
<b>Description:</b>	Students create and assess a venture plan.
<b>Parameters:</b>	No specialized equipment or facilities.
<b>Supporting Courses:</b>	ENT1010: Challenge & Opportunity ENT1020: Elements of a Venture Plan
<b>Outcomes:</b>	The student will:

### **1. implement a venture**

- 1.1 identify the startup requirements for the venture
- 1.2 select the form of business ownership for the venture
- 1.3 analyze why businesses fail and illustrate the consequences of poor and/or inadequate planning
- 1.4 devise and implement a market plan considering:
  - 1.4.1 sales and distribution
  - 1.4.2 advertising
  - 1.4.3 pricing
- 1.5 explain the need for and limitations of a budget and its implications in the financial plan of the venture including:
  - 1.5.1 income
  - 1.5.2 expenditures; e.g., production, labour, distribution, marketing
- 1.6 prepare a cash flow projection
- 1.7 identify human resource needs and how these are to be met
- 1.8 identify career ladders for personnel

### **2. describe management procedures required to start the venture**

- 2.1 describe the functions of management
- 2.2 identify procedures required to start a venture

### **3. demonstrate leadership qualities in implementing the venture**

- 3.1 explain management models and leadership styles
- 3.2 demonstrate problem-solving and decision-making abilities at each implementation stage of the venture
- 3.3 explain short- and long-range plans for the venture

### **4. assess the venture**

- 4.1 design a strategy for measuring, monitoring and controlling results against the plans
- 4.2 describe the product or service in terms of:
  - 4.2.1 characteristics; e.g., quality, excellence
  - 4.2.2 labour; e.g., availability, efficiency, effectiveness
  - 4.2.3 suppliers
  - 4.2.4 equipment/technology
  - 4.2.5 property and facilities
  - 4.2.6 cost data

- 4.3 compare and contrast various ways of assessing ventures
- 4.4 identify a set of criteria to assess the venture
- 4.5 explain personal/individual motives in relation to the development and creation of the venture
- 4.6 relate leadership strategies to venture analysis
- 4.7 evaluate the lifestyle implications of the venture
- 4.8 analyze the venture in terms of change and trends projected for the future
- 4.9 prepare a written critique of the venture
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE ENT2910: ENT PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ENT2920: ENT PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

#### **1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

#### **2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

#### **3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE ENT3010: MANAGING THE VENTURE**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop management procedures for a venture.

**Parameters:** No specialized equipment or facilities.

**Supporting Course:** ENT2040: Create the Venture

**Outcomes:** The student will:

- 1. describe management procedures necessary to implement the venture**
  - 1.1 evaluate the objectives and goals of the venture plan
  - 1.2 create an organizational structure to achieve the goals and objectives of the venture
- 2. manage the venture by making decisions**
  - 2.1 create a plan of action to fulfill venture requirements in terms of:
    - 2.1.1 capital
    - 2.1.2 labour
    - 2.1.3 marketing
    - 2.1.4 production/service
  - 2.2 appraise government regulations dealing with:
    - 2.2.1 health; e.g., *Public Health Act*
    - 2.2.2 safety; e.g., *Occupational Health and Safety Act*
    - 2.2.3 compensation
    - 2.2.4 terms and conditions of employment; e.g., *Canada Labour Code, Employment Standards Act*
  - 2.3 describe ethical and unethical business practices
  - 2.4 create and maintain effective internal/external communication functions
- 3. manage the venture by managing human resources**
  - 3.1 describe the necessary components/strategies of:
    - 3.1.1 recruitment
    - 3.1.2 human resource development
  - 3.2 explain the role of the human resources area within business
  - 3.3 explain the characteristics for a supervisor role
  - 3.4 describe the tangible and intangible components of recognition
- 4. manage the venture by managing finances**
  - 4.1 describe source documents including:
    - 4.1.1 sales receipts
    - 4.1.2 cash register records
    - 4.1.3 cheque stubs
  - 4.2 describe accounting functions including:
    - 4.2.1 cash flow
    - 4.2.2 profit and loss
    - 4.2.3 balance sheet

- 4.3 perform banking functions including:
  - 4.3.1 identify banking institutions
  - 4.3.2 properly complete various forms
- 4.4 create a sample payroll
- 4.5 explain the function of accounts receivable and accounts payable in relation to cash flow
- 5. describe procedures to monitor and revise the venture plan**
  - 5.1 evaluate the impact of working conditions on organizational culture
  - 5.2 explain the impact of morale on productivity
  - 5.3 demonstrate dispute resolution strategies
  - 5.4 demonstrate negotiating skills
  - 5.5 propose a system to deal with tardiness and absenteeism
  - 5.6 devise a plan to encourage:
    - 5.6.1 team building
    - 5.6.2 professionalism
  - 5.7 complete a performance appraisal
- 6. describe the monitoring procedure and revisions to the venture plan**
  - 6.1 identify factors in the venture plan that require monitoring including:
    - 6.1.1 cash flow
    - 6.1.2 customer/client satisfaction
    - 6.1.3 human resource effectiveness
    - 6.1.4 supplies and inventory
    - 6.1.5 other factors
  - 6.2 create a time line indicating when and how often each factor will be monitored
  - 6.3 explain external factors that may affect the venture including:
    - 6.3.1 fluctuating economy
    - 6.3.2 fads
    - 6.3.3 seasonal variations
  - 6.4 propose adjustments to remedy inconsistencies
  - 6.5 identify strategies for changing a plan in progress
  - 6.6 describe circumstances when it may be appropriate to downsize or terminate the venture
  - 6.7 devise a plan to address the requirements and responsibilities involved in downsizing or terminating a venture
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. create a transitional strategy to accommodate personal changes and build personal values**
  - 8.1 identify short-term and long-term goals
  - 8.2 identify steps to achieve goals

**COURSE ENT3020: EXPANDING THE VENTURE**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students explore and assess the elements of success in expanding a venture.

**Parameters:** No specialized equipment or facilities.

**Outcomes:** The student will:

**1. describe the rationale for expanding a particular venture**

- 1.1 analyze the rationale for expanding a particular venture, taking into consideration:
  - 1.1.1 personal criteria; e.g., values, goals, expertise
  - 1.1.2 economic criteria
  - 1.1.3 financial criteria
  - 1.1.4 social/ethical criteria
  - 1.1.5 personal definition of a successful venture
- 1.2 compare personal philosophy with venture goals
- 1.3 evaluate the options available for expansion including:
  - 1.3.1 vertical or horizontal expansion
  - 1.3.2 diversification

**2. identify the options available and describe an expansion strategy**

- 2.1 identify and appraise the conditions that indicate the possibility for expansion
- 2.2 predict the impact of expansion on the roles within the venture
- 2.3 devise realistic goal expectations for expansion
- 2.4 identify possible directions for expansion
- 2.5 explain the concept of franchising as a means of expanding business
- 2.6 evaluate the benefits and risks
- 2.7 explain the process of establishing franchises

**3. describe a plan to expand a particular venture**

- 3.1 analyze the limitations resulting from the type of venture involved
- 3.2 design a plan for implementing the expansion
- 3.3 devise a strategy to achieve the expansion that includes:
  - 3.3.1 managing
  - 3.3.2 financing
  - 3.3.3 promotion

**4. describe the elements of success in the expanded venture**

- 4.1 identify the social consequences
- 4.2 analyze the degree of success in achieving the financial goals
- 4.3 predict the need for future/continued expansion

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE ENT3910: ENT PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

#### **1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

#### **2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

#### **3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

**COURSE ENT3920: ENT PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals



**COURSE FIN1010: PERSONAL FINANCIAL INFORMATION**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students explore concepts that affect the finances of an individual, including a code of conduct, the economic environment, acquiring and using financial resources and the effects of government legislation.

**Parameters:** No specialized equipment or facilities.

**Outcomes:** The student will:

**1. explain the importance of a code of conduct**

- 1.1 define ethical conduct within the scope of personal financial management
- 1.2 explain ethical issues through the use of case studies
- 1.3 identify appropriate ethical conduct for an individual as it relates to personal and business dealings

**2. identify and explain factors that affect an individual's financial management**

- 2.1 describe the regulations and policies of levels of government, which affect financial management for an individual; e.g., municipal bylaws, provincial labour laws, taxation laws
- 2.2 identify sources of information and assistance available to an individual
- 2.3 identify examples of the effects of the economy on decision making and planning for an individual; e.g., interest rates, price changes, environmental issues, competition, foreign currency exchange
- 2.4 describe how compound interest works to increase investments over time
- 2.5 explore the concept of "paying yourself first" and how the rule of 72 can help determine investment objectives
- 2.6 analyze the direct relationship between expected returns and risk in terms of:
  - 2.6.1 time limit or horizon; e.g., amount of time
  - 2.6.2 cash requirement; e.g., amount of money
  - 2.6.3 liquidity; e.g., how fast the asset can be turned back into cash
  - 2.6.4 emotional factors; e.g., "Will you lose sleep over an investment?"

**3. identify and explain personal acquisition and use of financial resources**

- 3.1 list the methods of acquiring capital
- 3.2 identify the services offered by financial institutions to an individual
- 3.3 describe potential problems for an individual using credit
- 3.4 identify the insurance requirements for an individual
- 3.5 discuss strategies to improve/increase personal net worth including:
  - 3.5.1 work for others; e.g., paycheck
  - 3.5.2 self-employment
  - 3.5.3 owning your own business; e.g., profit/loss
  - 3.5.4 decrease debt; e.g., liabilities
  - 3.5.5 save more and/or spend less
  - 3.5.6 invest your savings

- 3.6 identify and discuss the following three elements of an investment goal:
  - 3.6.1 objective; e.g., safety of principal, earn income, achieve growth
  - 3.6.2 time limit; e.g., short-, medium- or long-term
  - 3.6.3 strategies; e.g., select the right investment
- 3.7 identify and list different investments a person can choose from; e.g., short-term savings, savings accounts, term deposits, T-bills, stocks, bonds, mutual funds, precious metals, art, jewellery/precious stones, real estate, mortgages
- 3.8 demonstrate skills in managing bank accounts and services including:
  - 3.8.1 Internet banking
  - 3.8.2 Internet transactions
  - 3.8.3 stocks
  - 3.8.4 mutual funds
  - 3.8.5 Registered Retirement Savings Plan (RRSP)
  - 3.8.6 Registered Education Savings Plan (RESP)
  - 3.8.7 emerging technologies in banking
- 4. prepare a personal budget**
  - 4.1 explain what is meant by “developing a personal investment portfolio”
  - 4.2 prepare a realistic mock personal balance sheet; determine personal net worth including assets, liabilities and personal equity
  - 4.3 demonstrate understanding of how to create a personal budget
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices

**COURSE FIN1015: ACCOUNTING PREP**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students are introduced to accounting and terminology unique to financial accounting. They become familiar with financial statements, generally accepted accounting principles (GAAP) and how to prepare for the process of starting up a business.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials.

**Supporting Course:** INF1060: Spreadsheet 1 or  
INF2080: Spreadsheet 2

**Outcomes:** The student will:

**1. examine accounting practice**

- 1.1 describe the purposes of financial statements and their uses
- 1.2 explain the effects of GAAP on financial statements
- 1.3 compare the financial statements of a variety of types of businesses
- 1.4 identify and define assets, liabilities and capital

**2. set up an accounting system**

- 2.1 prepare an opening balance sheet
- 2.2 apply the accounting equation in the analysis of the balance sheet
- 2.3 describe the theory of a double entry system
- 2.4 identify and define revenue and expense accounts
- 2.5 prepare a chart of accounts
- 2.6 open the general ledger accounts
- 2.7 prepare the opening entry and post to the general ledger

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. make personal connections to the cluster content and processes to inform possible pathway choices**

- 4.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 4.2 create a connection between a personal inventory and occupational choices



**COURSE FIN1020: ACCOUNTING CYCLE 1**

**Level:** Introductory

**Prerequisite:** FIN1015: Accounting Prep

**Description:** Students are introduced to the accounting cycle for a service business. They will analyze and record business transactions up to trail balance for the fiscal period of a business using terminology unique to financial accounting.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials.

**Supporting Course:** INF1060: Spreadsheet 1 or  
INF2080: Spreadsheet 2

**Outcomes:** The student will:

**1. analyze business transactions**

- 1.1 identify the debit and the credit components of a transaction
- 1.2 demonstrate how each part of the accounting equation is affected and is in balance
- 1.3 identify the purpose of a petty cash fund
- 1.4 describe ethical issues of petty cash

**2. journalize transactions including:**

- 2.1 identify and compare the use and parts of a journal
- 2.2 record the entries for a service business for a monthly business cycle
- 2.3 record the entries to establish and to replenish the petty cash fund

**3. post journal entries to the appropriate general ledger accounts**

**4. identify the types of accounting errors and apply appropriate correction techniques**

**5. record ledger account balances on a trial balance**

**6. demonstrate basic competencies**

- 6.1 demonstrate fundamental skills to:
  - 6.1.1 communicate
  - 6.1.2 manage information
  - 6.1.3 use numbers
  - 6.1.4 think and solve problems
- 6.2 demonstrate personal management skills to:
  - 6.2.1 demonstrate positive attitudes and behaviours
  - 6.2.2 be responsible
  - 6.2.3 be adaptable
  - 6.2.4 learn continuously
  - 6.2.5 work safely
- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks

**7. make personal connections to the cluster content and processes to inform possible pathway choices**

- 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 7.2 create a connection between a personal inventory and occupational choices



**COURSE FIN1030: ACCOUNTING CYCLE 2**

**Level:** Introductory

**Prerequisite:** FIN1020: Accounting Cycle 1

**Description:** Students complete the accounting cycle for a service business, preparing financial statements and closing accounts. They also will explore other factors of a business, including budgets.

**Parameters:** Access to appropriate computer equipment, a computerized spreadsheet or financial software, the Internet and support materials.

**Supporting Course:** INF1060: Spreadsheet 1 or  
INF2080: Spreadsheet 2

**Outcomes:** The student will:

- 1. identify and apply the steps in the accounting cycle, from the worksheet to the post-closing trial balance, for a service business**
  - 1.1 record all ledger accounts in the trial balance section of the worksheet
  - 1.2 classify and record ledger account balances in the appropriate section of the worksheet and calculate the net income or net loss
  - 1.3 prepare an income statement, a statement of changes in owner's equity and a balance sheet from the information in a completed worksheet
  - 1.4 record closing entries in a journal
  - 1.5 post the closing entries to the appropriate accounts
  - 1.6 outline the purpose of a post-closing trial balance
  - 1.7 prepare a post-closing trial balance from the general ledger
- 2. recognize the need for preparing budgets**
  - 2.1 describe the need for preparing specific budgets as a planning tool
  - 2.2 prepare a simple budget for a small business
  - 2.3 compare actual revenues and expenditures with budgeted amounts for the purpose of decision making
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks

**4. make personal connections to the cluster content and processes to inform possible pathway choices**

- 4.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 4.2 create a connection between a personal inventory and occupational choices



**COURSE FIN1910: FIN PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE FIN2020: RETAIL ACCOUNTING 1**

**Level:** Intermediate

**Prerequisite:** FIN1030: Accounting Cycle 2

**Description:** Students apply specialized accounting procedures associated with buying and selling goods in a retail system with a credit system and a partnership.

**Parameters:** Access to appropriate computer equipment, software, the Internet and supporting materials.

**Outcomes:** The student will:

- 1. explore accounting procedures associated with buying and selling merchandise**
  - 1.1 differentiate between service and merchandising businesses
  - 1.2 compare the advantages with the disadvantages of using various journals
  - 1.3 describe the need for and recording of returns/allowances and sales taxes
  - 1.4 describe the relationship between the subsidiary ledgers and the controlling accounts
  - 1.5 describe the need for recording merchandise inventory
  - 1.6 introduce the concept "Cost of Goods Sold" and its relation to expenses; e.g., rent, wages, utilities
  - 1.7 describe the need for perpetual, periodic and year-end inventory calculations
- 2. analyze transactions for a small retail business and prepare journals and ledgers allowing for accounts receivable and payable**
  - 2.1 open accounts for a merchandising business
  - 2.2 analyze journal transactions specific to a merchandising business
  - 2.3 analyze and record business transactions in a journal(s)
  - 2.4 total and prove the journal(s)
  - 2.5 post from the journal(s) to the general and subsidiary ledgers
  - 2.6 prepare schedules of accounts for subsidiary ledgers
  - 2.7 prepare a trial balance for the general accounts
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. identify possible life roles related to the skills and content of this cluster**
  - 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 4.2 identify potential resources to minimize barriers and maximize opportunities





**COURSE FIN2030: RETAIL ACCOUNTING 2**

**Level:** Intermediate

**Prerequisite:** FIN2020: Retail Accounting 1

**Description:** Students continue to apply specialized accounting procedures by preparing financial statements, analyzing adjusting and closing entries and completing the accounting cycle for a retail business.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials.

**Outcomes:** The student will:

- 1. explore accounting practices for retail business including closing out the cycle**
  - 1.1 explain the purpose of adjusting entries
  - 1.2 describe the need for periodic and year-end inventory calculations
- 2. finalize the steps in the accounting cycle, from the worksheet to the post-closing trial balance**
  - 2.1 complete the eight-column worksheet
  - 2.2 calculate cost of goods sold
  - 2.3 prepare an income statement
  - 2.4 prepare a statement of change in owner's equity
  - 2.5 prepare a balance sheet
  - 2.6 journalize adjusting and closing entries
  - 2.7 post adjusting and closing entries
  - 2.8 prepare a post-closing trial balance
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. identify possible life roles related to the skills and content of this cluster**
  - 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 4.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE FIN2040: ACCOUNTING SOFTWARE**

**Level:** Intermediate

**Prerequisite:** FIN1030: Accounting Cycle 2

**Description:** Students learn and demonstrate use of an accounting software package for personal or business use. They will complete transactions and procedures typically used by an individual or a business.

**Parameters:** Access to appropriate computer equipment, business or personal accounting software and support materials.

**Supporting Course:** FIN2030: Retail Accounting 2

**Outcomes:** The student will:

- 1. demonstrate use of designated small business or personal accounting software**
  - 1.1 identify procedures required to use the accounting software package
  - 1.2 prepare a chart of accounts according to generally accepted accounting principles (GAAP)
  - 1.3 analyze transactions and enter data
  - 1.4 prepare the accounts for the next reporting period
  - 1.5 generate reports; e.g., trial balance, balance sheet
  - 1.6 identify possible errors that can occur during entry
  - 1.7 describe the use of the computer as a tool in processing data related to the accounting cycle
  - 1.8 compare and contrast manual and computerized accounting procedures
  - 1.9 describe why it is necessary to prepare a computer data backup system
- 2. apply consistent and appropriate work station routines**
  - 2.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 2.2 employ practices that security for hardware, software, supplies and personal work
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. identify possible life roles related to the skills and content of this cluster**
  - 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 4.2 identify potential resources to minimize barriers and maximize opportunities





**COURSE FIN2060: PERSONAL TAXATION**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students examine the Canadian income tax system through the preparation of a variety of personal income tax returns, completed manually and/or electronically.

**Parameters:** Access to appropriate computer equipment, personal accounting software and/or spreadsheet software, the Internet and supporting materials.

**Supporting Course:** FIN1010: Personal Financial Information

**Outcomes:** The student will:

**1. investigate the Canadian concept of taxation**

- 1.1 describe the different kinds of taxes and their purposes; e.g., Goods and Services Tax (GST), Provincial Sales Tax (PST), capital gains tax, inheritance tax
- 1.2 describe the role of the Canada Revenue Agency in the collection and distribution of direct taxes
- 1.3 research how to apply for a Social Insurance Number and its importance
- 1.4 explore the history and administration of the Canadian tax system
- 1.5 explain how Canadian tax dollars are spent
- 1.6 summarize the rights and responsibilities of the Canadian taxpayer; e.g., working overseas, earning extra income

**2. demonstrate skill in preparing personal income tax returns**

- 2.1 identify and describe the components of a personal income tax return
- 2.2 identify and list the types of documentation required for filing tax returns
- 2.3 prepare personal income tax returns
- 2.4 research the features of an electronic tax program
- 2.5 describe and compare various filing procedures; e.g., electronic filing, Internet filing, tax discounters

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. identify possible life roles related to the skills and content of this cluster**

- 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 4.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FIN2070: PAYROLL ACCOUNTING**

**Level:** Intermediate

**Prerequisite:** FIN1020: Accounting Cycle 1

**Description:** Students gain knowledge for establishing and operating a payroll system. They will use proper terminology and awareness of current rules and regulations of the payroll function.

**Parameters:** Access to appropriate computer equipment, software, the Internet and support materials.

**Outcomes:** The student will:

### **1. investigate the Canadian payroll requirements**

- 1.1 describe the legislated and taxation requirements related to payroll including a:
  - 1.1.1 opening a business account to obtain a business number
  - 1.1.2 registering for a payroll deductions account

### **2. prepare and maintain a payroll system**

- 2.1 identify proper payroll terminology
- 2.2 prepare documentation required by employees for payroll purposes including:
  - 2.2.1 TD-1 tax form
  - 2.2.2 personal tax credits return
  - 2.2.3 Social Insurance Number
- 2.3 calculate regular and nonregular individual pay/gross pay using:
  - 2.3.1 salary; e.g., yearly, monthly
  - 2.3.2 wage; e.g., weekly, hourly
  - 2.3.3 payment periods; e.g., yearly, biweekly, weekly
- 2.4 calculate deductions for income tax, Canada Pension Plan, employment insurance and other deductions such as registered pension plan, union dues and medical benefits; identify:
  - 2.4.1 employee contributions
  - 2.4.2 employer contributions
- 2.5 calculate net pay for various payment periods; e.g., monthly, biweekly
- 2.6 complete the employees' earnings record
- 2.7 demonstrate methods of payment; e.g., cheque, direct deposit
- 2.8 complete a payroll register using appropriate tax tables
- 2.9 journalize payroll transactions
- 2.10 post payroll entries
- 2.11 record payment of payroll liabilities and identify withholding funds, payroll taxes and other deductions
- 2.12 complete a record of employment for termination purposes
- 2.13 report the employee's income and deductions on the appropriate T4 or T4A slip

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems

- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. identify possible life roles related to the skills and content of this cluster**
  - 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 4.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE FIN2910: FIN PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE FIN2920: FIN PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE FIN3010: ADVANCED ACCOUNTING**

**Level:** Advanced

**Prerequisite:** FIN2030: Retail Accounting 2

**Description:** Students apply advanced accounting procedures, including capital assets and uncollectible accounts, used by a variety of businesses. Students also prepare adjustments, using the accrual method of accounting, and examine manufacturing or departmental accounting.

**Parameters:** Access to appropriate computer equipment, the Internet and appropriate software.

**Outcomes:** The student will:

- 1. define terms relevant to capital assets, uncollectible accounts, accruals and manufacturing or departmental accounting**
  - 1.1 analyze accounting principles to determine whether to record the acquisition as an asset or an expense
  - 1.2 define depletion expense related to natural resources
  - 1.3 explain differences in accounting procedures between a merchandising business and a manufacturing business
  - 1.4 explain the purpose of a departmental accounting system
  - 1.5 describe the scope and nature of specialized accounting responsibilities in regard to departmentalized accounting, and the manner in which these might be assigned including:
    - 1.5.1 individuals in different locations
    - 1.5.2 a computer in a central location or in each department
    - 1.5.3 control measures that would be required
    - 1.5.4 gathering of information at specific times
- 2. apply advanced accounting procedures that relate the above terms to realistic business situations**
  - 2.1 calculate and record the amortization of capital assets
  - 2.2 record the acquisition of capital assets; e.g., a trade-in
  - 2.3 journalize and post entries involving the disposal of capital assets
  - 2.4 prepare a capital assets schedule
  - 2.5 prepare a statement of accounts receivable (aging)
  - 2.6 calculate the value of uncollectible accounts receivable using a variety of methods
  - 2.7 record journal entries for uncollectible accounts receivable using the allowance method
  - 2.8 prepare journal entries to write-off uncollectible accounts receivable
  - 2.9 record journal entries for the collection of accounts previously written-off
  - 2.10 prepare the adjustments needed to update particular general ledger accounts to include accruals; e.g., payroll, interest
  - 2.11 record journal entries for a manufacturing business
  - 2.12 prepare a statement of cost of goods manufactured
  - 2.13 prepare journal entries from data supplied

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

**4. create a transitional strategy to accommodate personal changes and build personal values**

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

## **COURSE FIN3020: MANAGEMENT ACCOUNTING**

**Level:** Advanced

**Prerequisite:** FIN2030: Retail Accounting 2

**Description:** Students examine and explain management accounting, which involves optimizing capital assets for maximum return on investments. Students also examine various internal systems used to safeguard business assets.

**Parameters:** Access to an appropriate computer work station, the Internet and appropriate software.

**Outcomes:** The student will:

- 1. assess return on investments, by analyzing the price/cost and break-even points**
  - 1.1 describe management accounting
  - 1.2 differentiate between the fields of managerial accounting and financial accounting
  - 1.3 define and explain cost and differentiate between fixed and variable costs
  - 1.4 describe the factors to consider when establishing selling prices
  - 1.5 define and calculate break-even points
  - 1.6 analyze the effect on net income when changes in volume costs, unit prices or sales mix occur
- 2. examine internal controls used to safeguard organizational assets**
  - 2.1 define an internal control system
  - 2.2 describe internal auditing procedures appropriate to a business
  - 2.3 describe specific controls; e.g., over cash, inventory
  - 2.4 compare items from the records of a business to a statement from the bank to:
    - 2.4.1 explain the differences
    - 2.4.2 describe methods used to reconcile the differences
    - 2.4.3 prepare bank reconciliations showing a number of differences
    - 2.4.4 prepare the general journal entries resulting from the corrected bank reconciliation statement
  - 2.5 analyze the financial implications of maintaining an inventory
  - 2.6 identify optimal inventory levels
  - 2.7 describe procedures used to count and record a physical inventory
  - 2.8 calculate the value of inventory using a variety of methods and making adjustments for obsolete inventory
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely

- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. **create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals



**COURSE FIN3030: CAPITAL ACCOUNTING**

**Level:** Advanced

**Prerequisite:** FIN2030: Retail Accounting 2

**Description:** Students examine the accounting procedures related to proprietorships, partnerships, corporations and other entities. Students determine the effect the different forms of business ownership have on the equity section of the balance sheet.

**Parameters:** Access to an appropriate computer work station, the Internet and appropriate software.

**Supporting Courses:** FIN2070: Payroll Accounting  
FIN3050: Small Business Taxation

**Outcomes:** The student will:

**1. examine the organizational differences among various forms of business organizations**

- 1.1 define accounting terms relevant to various types of business organization
- 1.2 describe the financial, legal and tax implications of a:
  - 1.2.1 sole proprietorship
  - 1.2.2 partnership
  - 1.2.3 corporation
- 1.3 analyze the most common types of partnerships
- 1.4 analyze the formation and organization of a corporation
- 1.5 differentiate between private and public corporations
- 1.6 define a franchise and distinguish between product distribution and entire business franchising
- 1.7 describe the major differences between buying a franchise and buying a nonfranchise business
- 1.8 describe the differences between a cooperative and a corporation; e.g., voting, distribution of net income
- 1.9 describe the reasons for establishing a nonprofit organization
- 1.10 describe the legislation related to nonprofit organizations
- 1.11 describe the difference between viable multilevel marketing versus pyramid schemes and “get rich quick schemes” including:
  - 1.11.1 list and explain compliance in relation to multilevel marketing organizations

**2. compare the owner’s equity for different forms of business organizations**

- 2.1 explain the changes in owner’s equity resulting from additional investments or withdrawals of capital funds for a sole proprietorship
- 2.2 analyze data related to the partners’ equity section of the balance sheet; e.g., initial investment, share of net profit or loss, additional partner investments, withdrawals
- 2.3 analyze data related to the shareholders’ section of the balance sheet including differences between classes of shares
- 2.4 prepare owner’s equity statements for various types of business organizations including:
  - 2.4.1 statement of proprietor’s equity, include additional investment or withdrawal of capital funds
  - 2.4.2 statement of distribution of net income and statement of partners’ equity
  - 2.4.3 statement of shareholders’ equity

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. create a transitional strategy to accommodate personal changes and build personal values**

- 4.1 identify short-term and long-term goals
- 4.2 identify steps to achieve goals

## **COURSE FIN3040: FINANCIAL STATEMENTS**

**Level:** Advanced

**Prerequisite:** FIN2030: Retail Accounting 2

**Description:** Students examine the content and structure of financial statements and prepare customized financial statements for a variety of businesses.

**Parameters:** Access to an appropriate computer work station, the Internet and appropriate software.

**Supporting Course:** FIN3030: Capital Accounting

**Outcomes:** The student will:

**1. examine the purposes of financial statements; e.g., the balance sheet, the income statement**

- 1.1 explain how a balance sheet reflects the financial position of a business on a specific date
- 1.2 explain how the income statement reflects the financial operations of a business for a specific period of time
- 1.3 outline and describe the reasons for the accepted formats
- 1.4 describe the purpose of notes to the financial statements
- 1.5 explain the difference between financial statements prepared from audited records and financial statements that have been reviewed by an auditor including:
  - 1.5.1 owner's equity
- 1.6 identify specific items within each component; e.g., current assets such as petty cash, accounts receivables, allowance for doubtful accounts, inventory
- 1.7 identify specific items within each component; e.g., cost of merchandise sold such as opening inventory, purchases, purchase returns and allowances, purchase discounts

**2. adapt the financial statements to various types of businesses**

- 2.1 compare various accounts required by different types of businesses; e.g., service, retail, agriculture, manufacturing, construction, processing
- 2.2 prepare financial statements for comparison including:
  - 2.2.1 prepare simple multi-year comparative income statements and balance sheets
  - 2.2.2 prepare common-size income statements and balance sheets
  - 2.2.3 use comparative ratios to analyze changes in financial position including document changes in a financial analysis report

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely

- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. **create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals



**COURSE FIN3050: SMALL BUSINESS TAXATION**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students examine the tax system as it applies to small businesses in Canada by preparing income tax returns and by exploring the other records and deductions that are applicable to sole proprietorships and partnerships.

**Parameters:** Access to an appropriate computer work station, the Internet and software.

**Supporting Courses:** FIN2060: Personal Taxation  
FIN3030: Capital Accounting

**Outcomes:** The student will:

- 1. investigate the responsibilities of different business structures and the types of tax returns each business needs to complete**
  - 1.1 investigate sole proprietorships
  - 1.2 investigate partnerships
  - 1.3 investigate corporations
- 2. describe various business income for tax purposes**
  - 2.1 define different methods of reporting income for various types of business income; e.g., farming, fishing, home business
  - 2.2 define different sources of income; e.g., bad debts recovered, reserves, vacation trips and awards, government grants and subsidies
- 3. investigate the legal requirements for keeping records for tax obligations and entitlements**
  - 3.1 identify what records should be kept and what information should be in the records
  - 3.2 identify guidelines for retaining and destroying records
  - 3.3 identify what expenses are legitimate income tax deductions
  - 3.4 explore payroll deductions and how to report them
- 4. investigate Goods and Services Tax (GST)/Harmonized Sales Tax (HST) implications for transferring assets between business structures**
  - 4.1 define fair market value and its implications on transferring personal assets to the business
  - 4.2 identify the effect of buying an existing business and how to account for the purchase of the business assets for income tax purposes
- 5. investigate how to register a business for income tax reporting**
  - 5.1 explore how to register for a business number and/or GST registration number including:
    - 5.1.1 identify who has to register and how
    - 5.1.2 explore which businesses are exempt
  - 5.2 compare Alberta's requirements for tax collection to other provinces
- 6. investigate current changes in Canadian income taxes**
- 7. identify tax responsibilities when doing business**
  - 7.1 identify tax responsibilities when doing business across provinces
  - 7.2 identify tax responsibilities when doing business in other countries

- 8. demonstrate understanding by completing appropriate income tax forms for small businesses**
  - 8.1 keep appropriate records of any income
  - 8.2 support all income entries with original documents
  - 8.3 identify all necessary papers prior to preparing income tax returns
- 9. demonstrate basic competencies**
  - 9.1 demonstrate fundamental skills to:
    - 9.1.1 communicate
    - 9.1.2 manage information
    - 9.1.3 use numbers
    - 9.1.4 think and solve problems
  - 9.2 demonstrate personal management skills to:
    - 9.2.1 demonstrate positive attitudes and behaviours
    - 9.2.2 be responsible
    - 9.2.3 be adaptable
    - 9.2.4 learn continuously
    - 9.2.5 work safely
  - 9.3 demonstrate teamwork skills to:
    - 9.3.1 work with others
    - 9.3.2 participate in projects and tasks
- 10. create a transitional strategy to accommodate personal changes and build personal values**
  - 10.1 identify short-term and long-term goals
  - 10.2 identify steps to achieve goals

**COURSE FIN3060: FINANCIAL ANALYSIS**

**Level:** Advanced

**Prerequisite:** FIN3040: Financial Statements

**Description:** Students use formulas and ratios to evaluate the financial status of business organizations, interpret data, report results and recommend changes based on the analysis.

**Parameters:** Access to an appropriate computer work station, the Internet and appropriate software.

**Outcomes:** The student will:

**1. use appropriate data for reporting and decision making**

- 1.1 identify sources and uses of cash
- 1.2 describe comparative financial statements
- 1.3 analyze the purpose and use of comparative financial statements including the statement of changes in financial position
- 1.4 describe the purpose of a statement of changes in financial position
- 1.5 prepare a statement of changes in financial position
- 1.6 describe general-purpose and special-purpose reports
- 1.7 explain the frequency with which reports are prepared

**2. interpret data to recommend action**

- 2.1 describe what transactions during a fiscal period caused the changes in cash
- 2.2 analyze financial statements from previous years to determine historical trends
- 2.3 demonstrate the use of formulas and ratios to determine information about profitability and management of operations, resources and debt
- 2.4 interpret data obtained to recommend action to be taken
- 2.5 compare performance of a business with others in the same industry
- 2.6 compare performance of a business with others in the same geographical area

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. create a transitional strategy to accommodate personal changes and build personal values**

- 4.1 identify short-term and long-term goals
- 4.2 identify steps to achieve goals





## **COURSE FIN3070: FINANCIAL PLANNING**

**Level:** Advanced

**Prerequisite:** FIN3060: Financial Analysis

**Description:** Students explain the value of financial planning for a business. They explore the impact of economic trends, changing world markets and tax implications, all of which must be considered when preparing financial forecasts. The concept of market research also is discussed.

**Parameters:** Access to an appropriate computer work station, the Internet and appropriate software.

**Supporting Courses:** FIN3050: Small Business Taxation  
MAM3010: The Business Organization

**Outcomes:** The student will:

- 1. explain the value of financial planning and its value in achieving the financial and operational goals of an organization**
- 2. explore the impact of economic trends, changing world markets and tax implications**
  - 2.1 describe the factors that affect market demand; e.g., geographic area, competitors, target share, environmental factors
  - 2.2 describe the effects of political decisions on world markets and/or local markets
  - 2.3 explain the ramifications of world markets on local business forecasting
  - 2.4 describe the impact of economic trends including interest rates, inflation, competition, technology and labour market on financial planning
  - 2.5 relate financial planning to tax implications
  - 2.6 explain how long-term goals may be affected by sources of funding; e.g., equity financing, short-term and long-term debt financing, leasing/buying assets
  - 2.7 explain the impact of internal factors; e.g., technology, price changes, labour problems
  - 2.8 describe planning business transactions to minimize or postpone income taxes
  - 2.9 describe the financial factors to be considered when preparing a contract bid
- 3. design a forecast that incorporates internal and external factors**
  - 3.1 describe the benefits that a company may derive from a formal budgeting process
  - 3.2 explain what information is required to prepare a forecast for a business including:
    - 3.2.1 startup costs
    - 3.2.2 cash flow projections
    - 3.2.3 a capital plan
    - 3.2.4 an operating forecast
    - 3.2.5 a pro forma balance sheet
  - 3.3 prepare a forecast for a new business with data supplied
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE FIN3080: PERSONAL INVESTMENT PLANNING 1**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students are introduced to the capital market and the available securities when building a personal investment portfolio. Students research and analyze a variety of securities, including equities, fixed income and mutual funds.

**Parameters:** Access to an appropriate computer work station and the Internet.

**Supporting Courses:** FIN1010: Personal Financial Information  
FIN2060: Personal Taxation  
FIN3030: Capital Accounting

**Outcomes:** The student will:

### **1. demonstrate knowledge of investment terminology and concepts**

- 1.1 explore what is meant by the term “asset allocation” and describe each component; e.g., cash/cash equivalent, equities, fixed income
- 1.2 evaluate and identify “personal tolerance” for risk
- 1.3 explore and analyze sources of investment advice
- 1.4 describe the business cycle in terms of an expanding market versus a recession; e.g., bull market versus bear market
- 1.5 explain the term “stock exchange”
- 1.6 investigate and compare stock exchanges in Canada, the United States and other markets around the world
- 1.7 interpret stock quotes
- 1.8 define debt securities
- 1.9 list and describe the different debt securities available on the market; e.g., corporate bonds, provincial bonds, Canada Savings Bonds, debentures, treasury bills, guaranteed investment certificates
- 1.10 describe fixed-income securities in terms of risk and return; e.g., safety, income, return of principal
- 1.11 identify the components of a bond including:
  - 1.11.1 maturity date
  - 1.11.2 principal or face value
  - 1.11.3 interest rate; e.g., coupon
- 1.12 describe and compare bond yields for a variety of bonds
- 1.13 evaluate bonds in terms of when to buy and when to sell; e.g., interest rates, a company’s financial outlook, bond yield
- 1.14 interpret bond quotes
- 1.15 define and describe the cash or cash equivalent portion of an investment portfolio
- 1.16 identify cash equivalents; e.g., savings accounts, term deposits, money markets
- 1.17 distinguish basic differences between stocks, bonds and mutual funds
- 1.18 describe common types of mutual funds; e.g., money market, fixed income, growth or equity, balanced, ethical, global or foreign, index, specialty
- 1.19 define equity securities
- 1.20 define and use basic terminology related to equity securities

- 1.21 describe equities in terms of:
  - 1.21.1 size; e.g., small cap or large cap
  - 1.21.2 style; e.g., growth, value, income, high-quality
  - 1.21.3 geographic location; e.g., Canadian, American, Asian, European
- 1.22 describe equities in terms of the sector they are in including:
  - 1.22.1 interest sensitive; e.g., banks, insurance, utilities, real estate, pipelines
  - 1.22.2 consumer; e.g., merchandise, communication, media
  - 1.22.3 industrial; e.g., technology, transportation, conglomerates
  - 1.22.4 resources; e.g., oil and gas, metals, minerals, paper and forestry, gold, other precious metals
- 1.23 describe what a diversified equities portfolio would look like; e.g., varies in style, size, geographic location and sector
- 2. assess and compare three corporations competing within the same sector**
  - 2.1 assess and compare the overall positions of three companies competing in the same sector by:
    - 2.1.1 identifying the style of the stock
    - 2.1.2 identifying the sector
    - 2.1.3 identifying the type of products and/or services sold
    - 2.1.4 finding and comparing the price-earnings ratio (P/E Ratio)
    - 2.1.5 finding and comparing the dividend yields
    - 2.1.6 identifying risk and return of each stock
    - 2.1.7 using the rule of 72 to calculate how many years it will take for the stock to double
    - 2.1.8 explaining what you would invest in
- 3. analyze, pick and track stocks and/or bonds to meet a specific goal and financial objective**
  - 3.1 explain why an investor might allocate a portion of his or her portfolio to cash or cash equivalents
  - 3.2 research and select fixed-income securities that meet particular goals and objectives
  - 3.3 create a diversified equities portfolio to track over a specific period of time
  - 3.4 analyze the diversified portfolio on a daily, weekly or monthly basis, buying and selling as necessary to meet a specific goal or objective
- 4. research and compare a variety of mutual funds**
  - 4.1 compare different mutual funds and describe their makeup or contents in terms of asset allocation
  - 4.2 list the advantages of investing in mutual funds; e.g., affordability, diversification, liquidity, professional management, flexibility in amounts, recordkeeping
  - 4.3 list the disadvantages of investing in mutual funds; e.g., management fees and expenses, loss of control over investment decisions, managers' mistakes, tax efficiency
  - 4.4 describe the fees associated with mutual funds; e.g., management expense ratio, sales commissions such as front-end versus back-end versus no-load
  - 4.5 analyze investment styles of mutual fund managers including:
    - 4.5.1 growth managers—focus on stocks with high earning potential
    - 4.5.2 value managers—bottom-up strategy with focus on undervalued companies
    - 4.5.3 growth at a reasonable price managers—avoid extremes of either growth or value investing
    - 4.5.4 core managers—combination of growth and value



**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals



## **COURSE FIN3090: PERSONAL INVESTMENT PLANNING 2**

**Level:** Advanced

**Prerequisite:** FIN3080: Personal Investment Planning 1

**Description:** Students expand their knowledge of investing by analyzing the financial statements of a variety of companies, interviewing and critiquing an investment advisor, and creating investment portfolios using the steps of intelligent investing for short-term and long-term goals.

**Parameters:** Access to an appropriate computer work station and the Internet.

**Supporting Course:** FIN3040: Financial Statements

**Outcomes:** The student will:

- 1. calculate ratios and evaluate and compare the financial statements of separate companies**
  - 1.1 evaluate a variety of companies through their financial statements
  - 1.2 calculate a company's financial positions through its:
    - 1.2.1 balance sheet; e.g., working capital ratio, debt/equity ratio
    - 1.2.2 income statement; e.g., earnings per share, price per earnings ratio, dividend yield
- 2. critique an investment advisor**
  - 2.1 identify the different designations of professionals in the field of investment and financial planning including:
    - 2.1.1 Certified Financial Planner (CFP)
    - 2.1.2 Fellow of Canadian Securities Institute (FCSI)
    - 2.1.3 Canadian Investment Manager (CIM)
    - 2.1.4 Chartered Financial Analyst (CFA)
    - 2.1.5 Financial Management Advisor (FMA)
  - 2.2 research and determine the criteria for selecting an investment advisor
  - 2.3 describe how an investor is protected under the Canadian Investors Protection Fund
  - 2.4 evaluate an investment advisor
- 3. research and build a Retirement Savings Plan (RSP) investment portfolio using the steps of intelligent investing and taking into consideration the age and lifestyle of the investor, the specific goals and financial objectives of the investor and the risk tolerance of the investor**
  - 3.1 examine the history of the stock market over the past 50 years to:
    - 3.1.1 identify bull and bear markets
    - 3.1.2 find patterns between risk versus returns
  - 3.2 discuss the role inflation plays in determining actual or real return on investments
  - 3.3 compare the risks and returns between a variety of stocks, bonds and mutual funds
  - 3.4 calculate actual returns on a variety of investments
  - 3.5 discuss the social and ethical implications of purchasing stocks in certain companies; e.g., ethical investing such as environmental and social viewpoints
  - 3.6 describe the characteristics of a Registered Retirement Savings Plan (RRSP) including:
    - 3.6.1 investment portfolio created over a lifetime
    - 3.6.2 asset allocation; e.g., cash/cash equivalent, fixed income, diversified equities, mutual funds

- 3.6.3 maximum tax deductible contribution per year; e.g., 18% of previous year's earnings
- 3.6.4 amount of Canadian content (70%) and foreign content (30%)
- 3.7 examine the advantages and disadvantages of investing in an RRSP in Canada
- 3.8 describe the characteristics of a Registered Education Savings Plan (RESP)
- 3.9 describe the tax implications of investing including:
  - 3.9.1 tax on interest
  - 3.9.2 tax on dividends
  - 3.9.3 tax on capital gains
  - 3.9.4 tax sheltered until stock is sold
  - 3.9.5 tax sheltered until RRSP is cashed in
- 3.10 analyze asset allocation in relation to the life stage of an investor
- 3.11 re-evaluate investor's tolerance for risk
- 3.12 investigate other strategies for reducing risk; e.g., dollar cost averaging
- 4. research and build an investment portfolio for a short-term goal using the steps of intelligent investing and taking into consideration age and lifestyle of the investor, specific goals and financial objectives of the investor and risk tolerance of the investor**
  - 4.1 describe the different types of financial service companies including:
    - 4.1.1 banks
    - 4.1.2 trust companies
    - 4.1.3 insurance companies
    - 4.1.4 mutual fund dealers
    - 4.1.5 full-service brokers
    - 4.1.6 discount brokers
  - 4.2 discuss the *Financial Consumers Act* in terms of:
    - 4.2.1 how the Act protects investors
    - 4.2.2 what financial products and services are covered
    - 4.2.3 what rights and responsibilities investors have when buying financial products and services
    - 4.2.4 what the Act says about disputes, financial planners and plain language
  - 4.3 describe the steps of intelligent investing to build an investment portfolio including:
    - 4.3.1 set specific goals and financial objectives
    - 4.3.2 match investment objectives to asset classes
    - 4.3.3 analyze and select investments within the different asset classes in terms of risk, return, liquidity and time
    - 4.3.4 spread out risk; diversify the portfolio through size, style, sector and geography
  - 4.4 develop an investment plan using the steps of intelligent investing:
    - 4.4.1 for a short-term goal of under five years; e.g., a vacation, a car
    - 4.4.2 for a long-term goal of 20 years or more; e.g., retirement
  - 4.5 discuss the concept and value of being part of an investment club
  - 4.6 demonstrate how the Internet can be used as an investment tool to:
    - 4.6.1 learn investment concepts and strategies
    - 4.6.2 research companies
    - 4.6.3 get stock and bond quotes
    - 4.6.4 investigate mutual funds
    - 4.6.5 create mock portfolios
    - 4.6.6 take concept tests
  - 4.7 distinguish between fact and fiction when using the Internet for investing
  - 4.8 identify the pitfalls of the Internet as an investment tool



**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals



**COURSE FIN3910: FIN PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals



**COURSE FIN3920: FIN PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

## **COURSE INF1030: WORD PROCESSING 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students are introduced to the proper use of word processing software, including document creation, editing and printing of properly formatted documents.

**Parameters:** Access to a computer work station and word processing software.

**Outcomes:** The student will:

### **1. create and customize documents**

- 1.1 create and format simple documents; e.g., letter, memorandum, report, correspondence and tables suitable for personal use applications by:
  - 1.1.1 creating/opening a document
  - 1.1.2 accessing help and online references
  - 1.1.3 navigating a document
  - 1.1.4 entering text in a document
  - 1.1.5 selecting, replacing and deleting text
  - 1.1.6 saving and editing a document
  - 1.1.7 printing a document
  - 1.1.8 closing a document
- 1.2 lay out documents by:
  - 1.2.1 using and changing margins and tabs
  - 1.2.2 aligning text
  - 1.2.3 inserting and modifying headers and footers

### **2. format content**

- 2.1 format text and paragraphs by:
  - 2.1.1 modifying font, style, size and colour
  - 2.1.2 modifying paragraph spacing
  - 2.1.3 creating numbered and bulleted list
  - 2.1.4 setting indentations; e.g., first line, hanging indent, negative, both sides
- 2.2 manipulate text; e.g., cut, copy, paste
- 2.3 control pagination by:
  - 2.3.1 numbering pages
  - 2.3.2 inserting page breaks

### **3. work with visual content**

- 3.1 insert illustration; e.g., pictures, clip art
- 3.2 format text graphically; e.g., word art
- 3.3 insert and modify text boxes

### **4. organize content**

- 4.1 insert tables and lists to organize content
- 4.2 modify tables; e.g., merge/split cells, use shading, insert rows/columns

**5. review documents**

- 5.1 preview documents using:
  - 5.1.1 scroll
  - 5.1.2 zoom
- 5.2 use spell and grammar check
- 5.3 print preview documents

**6. apply consistent and appropriate work station routines**

- 6.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
- 6.2 employ practices that security for hardware, software, supplies and personal work

**7. demonstrate basic competencies**

- 7.1 demonstrate fundamental skills to:
  - 7.1.1 communicate
  - 7.1.2 manage information
  - 7.1.3 use numbers
  - 7.1.4 think and solve problems
- 7.2 demonstrate personal management skills to:
  - 7.2.1 demonstrate positive attitudes and behaviours
  - 7.2.2 be responsible
  - 7.2.3 be adaptable
  - 7.2.4 learn continuously
  - 7.2.5 work safely
- 7.3 demonstrate teamwork skills to:
  - 7.3.1 work with others
  - 7.3.2 participate in projects and tasks

**8. make personal connections to the cluster content and processes to inform possible pathway choices**

- 8.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 8.2 create a connection between a personal inventory and occupational choices



## **COURSE INF1050: DATABASE 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop skills in the proper use of a database management system by developing flat-file databases and demonstrating their use in personal and business applications.

**Parameters:** Access to appropriate computer equipment and a database management system with support materials.

**Outcomes:** The student will:

**1. create and structure flat-file databases**

- 1.1 create databases using a predefined template
- 1.2 define data needs and types by planning a database and identifying the key features needed for later entry; e.g., records, fields, layout
- 1.3 create a blank database
- 1.4 define and create a primary key
- 1.5 use help functions and references as appropriate

**2. create and format database elements**

- 2.1 identify the key features of a database system needed to create a simple table
- 2.2 create and modify tables
- 2.3 create fields and modify field properties using different methods of editing; e.g., design view, datasheet view, wizards
- 2.4 create forms from the fields identified
- 2.5 modify the form layout
- 2.6 create reports to meet different audiences
- 2.7 modify the report layout and page setup for presentation and printing

**3. enter and modify data**

- 3.1 enter, edit and delete records
- 3.2 navigate among records and fields
- 3.3 find and replace data
- 3.4 import data from other sources; e.g., spreadsheets
- 3.5 access data and define problems; e.g., manage information, make decisions

**4. present and share data**

- 4.1 create and modify queries
- 4.2 sort data in a variety of elements; e.g., tables, forms, queries
- 4.3 filter data
- 4.4 export data
- 4.5 split databases
- 4.6 save database objects as other file types
- 4.7 print database objects, including reports and queries
- 4.8 back up a database

**5. apply consistent and appropriate work station routines**

- 5.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
- 5.2 employ practices that security for hardware, software, supplies and personal work

**6. demonstrate basic competencies**

- 6.1 demonstrate fundamental skills to:
  - 6.1.1 communicate
  - 6.1.2 manage information
  - 6.1.3 use numbers
  - 6.1.4 think and solve problems
- 6.2 demonstrate personal management skills to:
  - 6.2.1 demonstrate positive attitudes and behaviours
  - 6.2.2 be responsible
  - 6.2.3 be adaptable
  - 6.2.4 learn continuously
  - 6.2.5 work safely
- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks

**7. make personal connections to the cluster content and processes to inform possible pathway choices**

- 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 7.2 create a connection between a personal inventory and occupational choices

## **COURSE INF1060: SPREADSHEET 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop skills in the proper use of spreadsheet software through general data manipulation and personal recordkeeping.

**Parameters:** Access to an appropriate computer work station and spreadsheet software.

**Outcomes:** The student will:

**1. demonstrate basic electronic spreadsheet software competence**

- 1.1 describe key features of the spreadsheet software
- 1.2 use help functions and references as appropriate

**2. create and manipulate data**

- 2.1 insert data using fill such as:
  - 2.1.1 cut, copy and paste cells
- 2.2 modify cell contents and formulas by:
  - 2.2.1 changing font, font size and style
  - 2.2.2 applying borders and copying cell contents
- 2.3 change worksheet views
- 2.4 manage worksheets including:
  - 2.4.1 rename a worksheet
  - 2.4.2 hide and unhide a worksheet

**3. format data and content**

- 3.1 format worksheets including:
  - 3.1.1 hide and show gridlines
  - 3.1.2 create, rename and duplicate worksheets
  - 3.1.3 add backgrounds
- 3.2 insert and modify rows and columns by:
  - 3.2.1 deleting and inserting rows and columns
  - 3.2.2 inserting and deleting cells
- 3.3 format cells and cell content including:
  - 3.3.1 edit, move and clear cell contents
  - 3.3.2 find and replace cell contents
  - 3.3.3 insert and edit hyperlinks
  - 3.3.4 convert text to columns
- 3.4 format data and tables by:
  - 3.4.1 applying table styles
  - 3.4.2 modifying and editing tables

**4. create and modify formulas**

- 4.1 reference data in formulas including:
  - 4.1.1 key and edit basic formulas
  - 4.1.2 use functions to create formulas
  - 4.1.3 copy and move formulas
  - 4.1.4 use relative, absolute and mixed references
  - 4.1.5 enter a range into a formula by dragging
- 4.2 summarize data using subtotals with various techniques; e.g., autosum, cell referencing
- 4.3 display and print formulas

- 5. present data visually**
  - 5.1 create and format charts and diagrams
  - 5.2 modify and position chart elements
  - 5.3 insert and modify illustrations by:
    - 5.3.1 inserting, moving and sizing graphics
  - 5.4 sort and filter data using:
    - 5.4.1 simple sorts and filter sorts
- 6. collaborate and secure data**
  - 6.1 save and print workbooks including:
    - 6.1.1 use print preview
    - 6.1.2 change page orientation
    - 6.1.3 set print area
    - 6.1.4 create headers and footers
    - 6.1.5 set print options
    - 6.1.6 print workbook and selections
- 7. apply consistent and appropriate work station routines**
  - 7.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 7.2 employ practices that security for hardware, software, supplies and personal work
- 8. demonstrate basic competencies**
  - 8.1 demonstrate fundamental skills to:
    - 8.1.1 communicate
    - 8.1.2 manage information
    - 8.1.3 use numbers
    - 8.1.4 think and solve problems
  - 8.2 demonstrate personal management skills to:
    - 8.2.1 demonstrate positive attitudes and behaviours
    - 8.2.2 be responsible
    - 8.2.3 be adaptable
    - 8.2.4 learn continuously
    - 8.2.5 work safely
  - 8.3 demonstrate teamwork skills to:
    - 8.3.1 work with others
    - 8.3.2 participate in projects and tasks
- 9. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 9.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 9.2 create a connection between a personal inventory and occupational choices



## **COURSE INF1070: DIGITAL PRESENTATION**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop skills with tools used for computerized presentations involving text, data, graphics, sound and animation.

**Parameters:** Access to appropriate computer equipment, presentation software and support materials.

**Outcomes:** The student will:

### **1. design, create and format digital presentations**

- 1.1 create new presentations including:
  - 1.1.1 create new presentations from templates
  - 1.1.2 create and edit a new custom presentation/show
- 1.2 customize slides by:
  - 1.2.1 using a slide master
  - 1.2.2 customizing backgrounds
- 1.3 add elements to slides including:
  - 1.3.1 graphics
  - 1.3.2 footers and headers
- 1.4 create and change presentation elements by:
  - 1.4.1 applying transition effects
  - 1.4.2 selecting slides on a show
  - 1.4.3 setting up and running a slide show
- 1.5 arrange slides to improve flow by:
  - 1.5.1 using normal and slide view to arrange slides
  - 1.5.2 adding, deleting and rearranging slides

### **2. create and format slide content**

- 2.1 insert and format text and text boxes including:
  - 2.1.1 add and delete text on a slide
  - 2.1.2 edit text on a slide
  - 2.1.3 size and format text boxes
  - 2.1.4 insert text from another source
- 2.2 manipulate text in the following ways:
  - 2.2.1 copy, cut and paste text
  - 2.2.2 promote and demote text
  - 2.2.3 add and modify text art on a slide; e.g., word art
  - 2.2.4 modify fonts and font styles
  - 2.2.5 modify font size and colour
  - 2.2.6 align text and change line spacing
  - 2.2.7 format text using an alternative source; e.g., painter
  - 2.2.8 add and modify bulleted lists
  - 2.2.9 add and modify numbered lists
- 2.3 add and link existing content to a presentation by:
  - 2.3.1 copying and pasting elements from one slide to another
  - 2.3.2 copying and pasting elements between presentations
  - 2.3.3 copying and pasting slides between presentations

- 2.3.4 adding hyperlinks to a presentation
  - 2.3.5 inserting media clips into slides
- 2.4 apply, customize, modify and remove animations including:
  - 2.4.1 add animation and effects to a graphic, text box or photo
  - 2.4.2 create and modify custom animations
- 3. work with visual content**
  - 3.1 insert illustrations and shapes by:
    - 3.1.1 adding clip art to a slide
    - 3.1.2 creating a diagram; e.g., SmartArt
    - 3.1.3 applying styles to diagram
    - 3.1.4 adding a picture to a slide
    - 3.1.5 adding shapes to slides
  - 3.2 modify illustrations including:
    - 3.2.1 change the size and colour of a graphic
    - 3.2.2 format and add an effect to a shape
    - 3.2.3 rotate, resize and recolour a photo
  - 3.3 arrange illustrations and other content including:
    - 3.3.1 place illustrations in order
    - 3.3.2 align and connect pictures
    - 3.3.3 rotate and align shapes and graphics
    - 3.3.4 display grids and guides
  - 3.4 insert and modify charts including:
    - 3.4.1 create and apply styles to a chart
  - 3.5 insert and modify tables including:
    - 3.5.1 create and apply styles to a table
- 4. collaborate on and deliver presentations**
  - 4.1 review presentations including:
    - 4.1.1 add, edit and delete comments
  - 4.2 secure and share presentations by:
    - 4.2.1 using document inspector to remove information
    - 4.2.2 saving presentations and slide shows
  - 4.3 prepare printed materials including:
    - 4.3.1 print outlines and speaker notes
    - 4.3.2 use pens, highlighters and arrows
    - 4.3.3 rehearse and save timings
  - 4.4 prepare for and rehearse presentation delivery by:
    - 4.4.1 adding action buttons
    - 4.4.2 hiding slides
    - 4.4.3 navigating through the slide show
    - 4.4.4 rehearsing timings
    - 4.4.5 packaging and storing presentations
    - 4.4.6 exporting a presentation to another program
- 5. apply consistent and appropriate work station routines**
  - 5.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 5.2 employ practices that security for hardware, software, supplies and personal work
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems

- 6.2 demonstrate personal management skills to:
  - 6.2.1 demonstrate positive attitudes and behaviours
  - 6.2.2 be responsible
  - 6.2.3 be adaptable
  - 6.2.4 learn continuously
  - 6.2.5 work safely
- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks
- 7. **make personal connections to the cluster content and processes to inform possible pathway choices**
  - 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 7.2 create a connection between a personal inventory and occupational choices





**COURSE INF1910:        INF PROJECT A**

**Level:**                    Introductory

**Prerequisite:**            None

**Description:**            Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:**            This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE INF2020: KEYBOARDING**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students enhance their occupational level keyboarding competence of all keystroke functions, using unedited, edited and straight copy material.

**Parameters:** Access to a computer work station and software.

**Outcomes:** The student will:

### **1. demonstrate proficient keyboarding competence**

- 1.1 use text entry between 30–50 words per minute using a keyboard
  - 1.1.1 with a syllabic index between 1.2 to 1.35
  - 1.1.2 with a maximum of one uncorrected error
- 1.2 use numeric entry between 100–150 keystrokes per minute using a numeric keypad, with a maximum of one uncorrected error
- 1.3 use touch-keystroke alphabetic, numeric, punctuation and service keys
- 1.4 proofread and edit
- 1.5 minimize errors; e.g., spelling, keystroking, punctuation, spacing, transposition, repetition, omissions
- 1.6 use appropriate commands and functions
- 1.7 use correct finger and key placement

### **2. apply consistent and appropriate work station routines**

- 2.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
- 2.2 employ practices that security for hardware, software, supplies and personal work

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

### **4. identify possible life roles related to the skills and content of this cluster**

- 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 4.2 identify potential resources to minimize barriers and maximize opportunities





## **COURSE INF2050: WORD PROCESSING 2**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop their skills in the proper use of word processing software, including document creation, editing and printing of properly formatted documents.

**Parameters:** Access to a computer work station, word processing software and support materials.

**Supporting Course:** INF1030: Word Processing 1

**Outcomes:** The student will:

### **1. create and customize documents**

- 1.1 create, format and edit documents; e.g., single or multiple page letter, multiple page report, tables suitable for personal and business use applications, new document setup, templates
- 1.2 lay out documents including:
  - 1.2.1 adjust margins and tabs
  - 1.2.2 modify header and footer setting, including page numbering
  - 1.2.3 create and modify columns
  - 1.2.4 change page orientation and paper size
  - 1.2.5 add a watermark and background
- 1.3 make documents and content easier to find by:
  - 1.3.1 setting standard properties; e.g., keywords, author, title
  - 1.3.2 inserting a hyperlink
  - 1.3.3 using “find, replace and go to”
  - 1.3.4 customizing using autocorrect

### **2. format content**

- 2.1 format text and paragraphs including:
  - 2.1.1 apply, create and edit format; e.g., styles, lists, bullets
  - 2.1.2 modify character spacing and scale
  - 2.1.3 manage content flow; e.g., controlling widows and orphans
- 2.2 manipulate text by:
  - 2.2.1 using advanced cut and paste skills; e.g., use the mouse and or clipboard to copy and move text
  - 2.2.2 inserting symbols and characters
  - 2.2.3 modifying bullet characters
- 2.3 control pagination including:
  - 2.3.1 format different sections in a document
  - 2.3.2 work with breaks; e.g., page, section, column

### **3. work with visual content**

- 3.1 insert and format illustrations by:
  - 3.1.1 creating and modifying graphics and shapes; e.g., SmartArt graphics, drawing toolbar
  - 3.1.2 adjusting image properties
  - 3.1.3 cropping, resizing, scaling and rotating a picture

- 3.2 insert and modify text boxes
- 3.3 text wrap and position visual content
- 4. organize content**
  - 4.1 structure content by:
    - 4.1.1 creating and using macros; e.g., repetitive text, building blocks
    - 4.1.2 working with bookmarks
  - 4.2 use tables and lists to organize content including:
    - 4.2.1 create a table of contents and index
    - 4.2.2 update a table of contents and index
    - 4.2.3 create an outline/document map
    - 4.2.4 convert a table to text and text to a table
  - 4.3 modify tables by:
    - 4.3.1 resizing cells and the table; e.g., dragging, setting height, width
    - 4.3.2 creating a header row
    - 4.3.3 sorting a tables of contents
    - 4.3.4 changing the position of text in a cell
    - 4.3.5 changing the direction of text in a cell
  - 4.4 insert and format references and captions by using:
    - 4.4.1 footnotes and endnotes
    - 4.4.2 notes; e.g., bibliography, citations
  - 4.5 merge documents and data sources by:
    - 4.5.1 preparing and performing a mail merge
    - 4.5.2 creating envelopes and labels for group mailing
- 5. review documents**
  - 5.1 manage tracked changes
  - 5.2 insert, modify and delete comments
  - 5.3 reveal source codes
- 6. share and secure content**
  - 6.1 convert documents to different file formats; e.g., PDF, Web page
- 7. apply consistent and appropriate work station routines**
  - 7.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 7.2 employ practices that security for hardware, software, supplies and personal work
- 8. demonstrate basic competencies**
  - 8.1 demonstrate fundamental skills to:
    - 8.1.1 communicate
    - 8.1.2 manage information
    - 8.1.3 use numbers
    - 8.1.4 think and solve problems
  - 8.2 demonstrate personal management skills to:
    - 8.2.1 demonstrate positive attitudes and behaviours
    - 8.2.2 be responsible
    - 8.2.3 be adaptable
    - 8.2.4 learn continuously
    - 8.2.5 work safely
  - 8.3 demonstrate teamwork skills to:
    - 8.3.1 work with others
    - 8.3.2 participate in projects and tasks
- 9. identify possible life roles related to the skills and content of this cluster**
  - 9.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 9.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE INF2070: DATABASE 2**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students expand their skills in the proper use of a database management system by developing relational databases and demonstrating their use in personal and business applications.

**Parameters:** Access to appropriate computer equipment, a database management system that supports relational databases and support materials. Students should have prior understanding of using a flat-file database.

**Supporting Course:** INF1050: Database 1

**Outcomes:** The student will:

### **1. create and structure relational databases**

- 1.1 define data needs and types for multiple tables within a database
- 1.2 plan and design the structure of the database and the necessary relationships
- 1.3 define and print table relationships
- 1.4 add, set, change and remove primary keys
- 1.5 define and modify multifield primary keys

### **2. create and format database elements**

- 2.1 create several tables within a database
- 2.2 identify fields and modify their properties; e.g., location, name, type, size, format
- 2.3 link tables and fields
- 2.4 apply data normalization rules
- 2.5 create forms using several methods, e.g., layout and design view, including:
  - 2.5.1 multi-item forms
  - 2.5.2 split forms
  - 2.5.3 subforms
  - 2.5.4 PivotTable forms
- 2.6 demonstrate appropriate format specifications and layout to create appropriate reports
- 2.7 add and modify controls and properties to reports and forms
- 2.8 import data from other files or sources

### **3. enter, modify and organize data**

- 3.1 access data and define problems; e.g., manage information, make decisions
- 3.2 input and process data including:
  - 3.2.1 create template files
  - 3.2.2 enter data into files
  - 3.2.3 update and edit data in files
- 3.3 link one or more databases
- 3.4 sort and filter data within several database elements; e.g., tables, queries, forms, reports
- 3.5 create and modify calculated fields and aggregate functions

### **4. create and modify queries**

- 4.1 create a query from single and multiple tables
- 4.2 save a filter as a query

- 4.3 modify a query by:
  - 4.3.1 adding and removing tables
  - 4.3.2 creating a calculated query field
  - 4.3.3 adding an alias to a query field
  - 4.3.4 creating aggregated queries
  - 4.3.5 adding criteria to find:
    - 4.3.5.1 selected records that meet several conditions
    - 4.3.5.2 selected records that do not match a specific condition
- 5. **manage, present and share data**
  - 5.1 identify object dependencies
  - 5.2 view objects and object data in other views
  - 5.3 create and modify charts
  - 5.4 save database objects as another file type
  - 5.5 print database objects
  - 5.6 export data to another source from database elements
  - 5.7 present a database in another format; e.g., Web page, data access page
  - 5.8 compact and repair a database
  - 5.9 analyze data to draw conclusions and make recommendations
- 6. **apply consistent and appropriate work station routines**
  - 6.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 6.2 employ practices that security for hardware, software, supplies and personal work
- 7. **demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. **identify possible life roles related to the skills and content of this cluster**
  - 8.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 8.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE INF2080: SPREADSHEET 2**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop skills in the proper use of spreadsheet software through advanced data manipulation and preparation of appropriate reports and printouts in text and graphic format.

**Parameters:** Access to an appropriate computer work station and spreadsheet software.

**Outcomes:** The student will:

**Supporting Course:** INF1060: Spreadsheet 1

### **1. create and manipulate data**

- 1.1 insert data using fill including:
  - 1.1.1 change font colour
- 1.2 change worksheet views including:
  - 1.2.1 split, freeze and unfreeze workbooks
  - 1.2.2 hide, unhide and arrange workbooks
  - 1.2.3 insert and modify page breaks
- 1.3 manage worksheets by:
  - 1.3.1 inserting, deleting and rearranging worksheets
  - 1.3.2 creating a workbook from a template

### **2. format data and content**

- 2.1 insert and modify rows and columns including:
  - 2.1.1 use text to create columns
  - 2.1.2 change row and column width and height
  - 2.1.3 hide and unhide columns and rows
  - 2.1.4 apply changes to horizontal and vertical alignment
  - 2.1.5 centre titles across a series of cells
  - 2.1.6 use a function to display current date and time
- 2.2 format data and table including:
  - 2.2.1 apply styles to cells

### **3. create and modify formulas**

- 3.1 use functions to create average, minimum and maximum; e.g., AVERAGE, MIN, MAX
- 3.2 use functions to count numbers, and count both text and numbers; e.g., COUNT, COUNTA
- 3.3 use functions to calculate interest rates, monthly payments and present value; e.g., PMT
- 3.4 use conditional logic in a formula; e.g., IF
- 3.5 summarize data using subtotals
- 3.6 format and modify text using formulas
- 3.7 look up data using a formula
- 3.8 protect formulas using lock and unlock

#### **4. present data visually**

- 4.1 create and format charts including:
  - 4.1.1 insert various chart types; e.g., 2-D column, pie, scatter
  - 4.1.2 use chart tools to create a clustered column graph
- 4.2 modify and position chart elements in a clustered graph
- 4.3 insert and modify illustrations by:
  - 4.3.1 inserting, moving and sizing graphics from an outside source; e.g., the Internet
- 4.4 sort and filter data including:
  - 4.4.1 two component simple sort
  - 4.4.2 two component filter sort
  - 4.4.3 outline data

#### **5. collaborate and secure data**

- 5.1 manage all changes to workbooks including:
  - 5.1.1 save and publish workbooks and worksheets as Web pages
  - 5.1.2 convert files to different formats
- 5.2 protect and share workbooks
- 5.3 prepare workbooks for distribution

#### **6. apply consistent and appropriate work station routines**

- 6.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
- 6.2 employ practices that security for hardware, software, supplies and personal work

#### **7. demonstrate basic competencies**

- 7.1 demonstrate fundamental skills to:
  - 7.1.1 communicate
  - 7.1.2 manage information
  - 7.1.3 use numbers
  - 7.1.4 think and solve problems
- 7.2 demonstrate personal management skills to:
  - 7.2.1 demonstrate positive attitudes and behaviours
  - 7.2.2 be responsible
  - 7.2.3 be adaptable
  - 7.2.4 learn continuously
  - 7.2.5 work safely
- 7.3 demonstrate teamwork skills to:
  - 7.3.1 work with others
  - 7.3.2 participate in projects and tasks

#### **8. make personal connections to the cluster content and processes to inform possible pathway choices**

- 8.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 8.2 create a connection between a personal inventory and occupational choices

## **COURSE INF2090: CORRESPONDENCE**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students enhance their skills in document production as they prepare various forms of correspondence in publishable form, using word processing and e-mail software.

**Parameters:** Access to appropriate computer equipment, storage medium, software, the Internet and support materials.

**Supporting Courses:** INF1030: Word Processing 1  
MAM1030: Communication Strategies 1  
INF2020: Keyboarding

**Outcomes:** The student will:

- 1. demonstrate efficient word processing skills to produce publishable documents for the purpose of correspondence**
  - 1.1 enter text from formatted copy in which text is:
    - 1.1.1 unedited
    - 1.1.2 draft
    - 1.1.3 final copy
  - 1.2 plan layout and enter text from unformatted copy in which text is:
    - 1.2.1 unedited
    - 1.2.2 draft
    - 1.2.3 final copy
- 2. create error-free, well-formatted correspondence**
  - 2.1 determine the intent and audience of the correspondence
  - 2.2 determine the method of delivery of the correspondence; e.g., mail, e-mail, fax, Web posting
  - 2.3 demonstrate skill in producing and editing a properly formatted letter and memorandum, using the following features:
    - 2.3.1 templates, macros and/or autotext
    - 2.3.2 letter parts; e.g., date, inside/return addresses, salutations, complimentary closing, name/title, references
    - 2.3.3 letter styles
    - 2.3.4 punctuation styles
    - 2.3.5 placement
    - 2.3.6 letterhead
    - 2.3.7 mailing notations
    - 2.3.8 address; e.g., labels, envelopes
    - 2.3.9 second page headings
    - 2.3.10 displaying paragraphs; e.g., enumerations
    - 2.3.11 using form letters and mail merge
    - 2.3.12 printing and saving documents using alternative formats

3. **identify and demonstrate formatting and etiquette for different forms of correspondence; e.g., e-mail, text messages**
4. **apply consistent and appropriate work station routines**
  - 4.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 4.2 employ practices that security for hardware, software, supplies and personal work
5. **demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
6. **identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE INF2100: REPORTS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students demonstrate efficient word processing skills to produce publishable reports in a variety of formats from formatted and unformatted copy under time constraints.

**Parameters:** Access to appropriate computer equipment, word processing software, the Internet and support materials.

**Supporting Courses:** INF2050: Word Processing 2  
INF2020: Keyboarding  
MAM2060: Communication Strategies 2

**Outcomes:** The student will:

- 1. prepare material for publication**
  - 1.1 edit and manipulate text proficiently
  - 1.2 replicate, convert and append files proficiently
  - 1.3 prepare templates, macros and autotext
  - 1.4 determine the intent of the report
- 2. produce publishable reports, including the following features:**
  - 2.1 title page
  - 2.2 titles, headings and subheadings
  - 2.3 table of contents
  - 2.4 outlines
  - 2.5 bound and unbound formats
  - 2.6 columns
  - 2.7 displayed paragraphs and quotes
  - 2.8 headers and footers
  - 2.9 citations; e.g., footnotes, reference list, bibliography
  - 2.10 appendices and indexes
  - 2.11 pagination
  - 2.12 a variety of embedded tables and charts
- 3. publish documents**
  - 3.1 print and save documents using alternative formats
  - 3.2 use electronic mail to send reports
- 4. apply consistent and appropriate work station routines**
  - 4.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 4.2 employ practices that security for hardware, software, supplies and personal work
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE INF2910: INF PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE INF2920:      INF PROJECT C**

**Level:**                      Intermediate

**Prerequisite:**            None

**Description:**            Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:**            This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE INF3010:     **HARDWARE & SOFTWARE ANALYSIS****

**Level:**                   Advanced

**Prerequisite:**         None

**Description:**         Students analyze, compare and evaluate hardware and software based on user requirements.

**Parameters:**         Access to computer equipment, appropriate software, the Internet and support materials.

**Supporting Course:**   NET2020: Workstation Technology & Operations

**Outcomes:**           The student will:

### **1.   analyze and compare computer hardware and operating systems**

- 1.1 demonstrate an advanced knowledge of the components that make up a computer system; e.g., central processing unit, memory, graphics card, expandability, input, output, ports
- 1.2 collect and compare information regarding operating systems; e.g., speed, cost, size, capabilities, warranties, restrictions
- 1.3 assess and compare system software and firmware
- 1.4 collect and compare information on computing hardware formats; e.g., desktop, laptop, tablet, personal digital assistant
- 1.5 assess and compare application software; e.g., data, text, graphics
- 1.6 discuss compatibility issues between computers and peripherals
- 1.7 access support manuals, documentation and resources

### **2.   present research on emerging computing technologies; e.g., voice input, syncing, Bluetooth, touch screen, cloud computing**

### **3.   prepare and present a report recommending hardware and software configurations that meet specified criteria**

- 3.1 identify computer user needs and variables
- 3.2 research potential alternatives and identify sources of information
- 3.3 compare and evaluate hardware and software compatibility with identified user needs
- 3.4 provide recommendations and rationale for particular hardware and software components based on a needs assessment that addresses:
  - 3.4.1 client needs
  - 3.4.2 information base
  - 3.4.3 implementation time lines
  - 3.4.4 financial costs
  - 3.4.5 work station requirements
  - 3.4.6 in-service training
  - 3.4.7 support services
  - 3.4.8 warranties
  - 3.4.9 legal restrictions
- 3.5 make and support recommendations using:
  - 3.5.1 appropriate industry standard format
  - 3.5.2 acceptable content and description
  - 3.5.3 appropriate terminology

- 4. apply consistent and appropriate work station routines**
  - 4.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 4.2 employ practices that security for hardware, software, supplies and personal work
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE INF3060: WORD PROCESSING 3**

**Level:** Advanced

**Prerequisite:** INF2050: Word Processing 2

**Description:** Students master their skills in the proper use of word processing software, including document creation, editing and printing of properly formatted documents.

**Parameters:** Access to a computer work station and word processing software.

**Note:** Students will meet all objectives outlined in the Microsoft Office Suite training. Upon successful completion of the Word Processing 1, 2 and 3 courses, students could write the Microsoft Specialist Exam for certification.

**Supporting Courses:** INF1030: Word Processing 1

**Outcomes:** The student will:

### **1. create and customize documents**

- 1.1 create, format and edit documents; e.g., multiple page letter, multiple page report, tables suitable for personal and business use applications, new document setup, common templates and forms such as purchase order, expense reports, travel requests, medical forms, Web page, e-mail
- 1.2 lay out documents including:
  - 1.2.1 modify fields in template form
  - 1.2.2 manipulate layout
  - 1.2.3 use objects and text boxes
  - 1.2.4 create and manage documents and subdocuments
  - 1.2.5 create and use a theme
- 1.3 make documents and content easier to find including:
  - 1.3.1 insert and edit hyperlinks to Web pages

### **2. format content**

- 2.1 format text and paragraphs including:
  - 2.1.1 reveal source codes to edit and format
  - 2.1.2 use language features; e.g., thesaurus, dictionary, research
  - 2.1.3 clear formats from a paragraph
- 2.2 manipulate text by:
  - 2.2.1 controlling paragraph behaviour
  - 2.2.2 manipulating columns
  - 2.2.3 adding text to a shape
- 2.3 control pagination by:
  - 2.3.1 manipulating advanced page settings; e.g., odd/even page numbers, formats

### **3. work with visual content**

#### **3.1 insert and format illustrations including:**

- 3.1.1 borders and shading
- 3.1.2 flowcharts
- 3.1.3 pictures

### **4. organize content**

#### **4.1 use tables and lists to organize content including:**

- 4.1.1 perform calculations in table cells
- 4.1.2 sort contents in a list
- 4.1.3 change formatting of a list
- 4.1.4 insert and update a table of figures

#### **4.2 insert and format captions by:**

- 4.2.1 adding captions to a document; e.g., figure, equation, table
- 4.2.2 editing and deleting captions

#### **4.3 merge documents and data sources including:**

- 4.3.1 compare and merge two versions of a document
- 4.3.2 combine changes made by different authors

### **5. review documents**

- 5.1 manage tracked changes
- 5.2 insert, modify and delete comments
- 5.3 reveal source codes

### **6. share and secure content**

- 6.1 prepare documents for sharing
- 6.2 restrict and protect document access
- 6.3 make sure a document is safe to share

### **7. apply consistent and appropriate work station routines**

- 7.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
- 7.2 employ practices that security for hardware, software, supplies and personal work

### **8. demonstrate basic competencies**

#### **8.1 demonstrate fundamental skills to:**

- 8.1.1 communicate
- 8.1.2 manage information
- 8.1.3 use numbers
- 8.1.4 think and solve problems

#### **8.2 demonstrate personal management skills to:**

- 8.2.1 demonstrate positive attitudes and behaviours
- 8.2.2 be responsible
- 8.2.3 be adaptable
- 8.2.4 learn continuously
- 8.2.5 work safely

#### **8.3 demonstrate teamwork skills to:**

- 8.3.1 work with others
- 8.3.2 participate in projects and tasks

### **9. create a transitional strategy to accommodate personal changes and build personal values**

- 9.1 identify short-term and long-term goals
- 9.2 identify steps to achieve goals



## **COURSE INF3080: PROJECT MANAGEMENT TOOLS**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop competence in using information management systems software, such as project management, schedules and planners for either personal or workplace applications.

**Parameters:** Access to an appropriate computer work station, a storage medium, information management software and support materials.

**Outcomes:** The student will:

### **1. demonstrate the ability to use information management software**

- 1.1 plan projects, including setting goals, time lines and determining resource needs by:
  - 1.1.1 organizing relevant data; e.g., building a house, putting on a play, building a multimedia presentation
  - 1.1.2 defining basic project information including identifying all key tasks, linking tasks (where appropriate) and assigning task duration
  - 1.1.3 organizing tasks into an outline and detailing each subtask including viewing different levels of task detail (e.g., expanding/collapsing), setting milestones and creating a base calendar
  - 1.1.4 creating resource lists including entering cost information, assigning resources and applying appropriate constraints
- 1.2 monitor projects, including time and resource management by:
  - 1.2.1 identifying critical issues
  - 1.2.2 resolving time restrictions
  - 1.2.3 resolving resource constraints
- 1.3 adjust project files, as appropriate, including:
  - 1.3.1 sort and filter data
- 1.4 prepare project reports

### **2. describe the features of the information management software used**

- 2.1 demonstrate the information management tool to others
- 2.2 describe the capabilities of the tool
- 2.3 describe how a person or business can benefit from the use of the management tool

### **3. apply consistent and appropriate work station routines**

- 3.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
- 3.2 employ practices that security for hardware, software, supplies and personal work

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE INF3095: PRODUCTIVITY SOFTWARE INTEGRATION**

**Level:** Advanced

**Prerequisites:** INF3060: Word Processing 3  
INF2070: Database 2  
INF2080: Spreadsheet 2  
INF1070: Digital Presentation

**Description:** Students enhance production skills by integrating data from a variety of sources into a finished product.

**Parameters:** Access to appropriate computer equipment, software and support materials.

**Outcomes:** The student will:

- 1. demonstrate competencies in word processing, spreadsheet, database and presentation software by creating integrated products**
  - 1.1 integrate data from a spreadsheet into a text document
  - 1.2 integrate text from a document into a spreadsheet
  - 1.3 create a linked object in a spreadsheet
  - 1.4 import data and formatting from a variety of source files into a spreadsheet
  - 1.5 import spreadsheet data into a database
  - 1.6 link a spreadsheet to a database table
  - 1.7 export database data to a spreadsheet
  - 1.8 export database data to a text document
  - 1.9 import data from a text document into a database
  - 1.10 import an outline from a text document into a presentation
  - 1.11 insert formatted text into a presentation
  - 1.12 import linked objects into a presentation
- 2. demonstrate competence in producing integrated documents, spreadsheets, databases and presentations**
  - 2.1 describe the purpose of the product including:
    - 2.1.1 target audience
    - 2.1.2 single/multiple/presentation copy
  - 2.2 apply word processing, spreadsheet, database and presentation commands, as appropriate, to import, export and link word processing, spreadsheet, database and presentation files
  - 2.3 manipulate word processing, spreadsheet, database and presentation files from drafts including:
    - 2.3.1 edited, unedited and unformatted
    - 2.3.2 edited and formatted
  - 2.4 follow instructions to customize/personalize existing text and data files including:
    - 2.4.1 load, redesign, reformat or modify existing templates and files containing information from spreadsheet, presentation, Web or graphics files
    - 2.4.2 revise documents to be aesthetically pleasing and well-formatted
    - 2.4.3 save file for print or display in audience-appropriate format
- 3. apply consistent and appropriate work station routines**
  - 3.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 3.2 employ practices that security for hardware, software, supplies and personal work

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

**COURSE INF3910: INF PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

**COURSE INF3920: INF PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE MAM1010: MARKETING & MANAGEMENT**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students identify basic management and marketing concepts and describe retail merchandising strategies of value to the retail employee, manager or owner.

**Parameters:** No specialized equipment or facilities.

**Outcomes:** The student will:

**1. identify and describe roles and features within an organization**

- 1.1 identify and describe the roles of management; e.g., planning, organizing, leading, monitoring, communicating
- 1.2 describe the role and evolution of retailing in Canada
- 1.3 identify and explain the functions of buying, selling and merchandising
- 1.4 identify and compare features of different forms of business ownership; e.g., sole proprietor, partnership, corporation, franchise, cooperative, conglomerate, multinational, crown corporation

**2. describe the characteristics of marketing and decisions made within the marketing mix**

- 2.1 identify the importance of marketing to a market economy
- 2.2 analyze the relationship between satisfying consumers and making a profit
- 2.3 identify the components of the “marketing mix”; e.g., four P’s: product, price, promotion, place, two C’s: consumers, competition
- 2.4 research decisions made in each component of the marketing mix
- 2.5 describe the focus marketing takes for different types of businesses including:
  - 2.5.1 manufacturers—product and service development
  - 2.5.2 wholesalers—marketing products and services to retailers and other businesses
  - 2.5.3 retailers—marketing to end user (the ultimate consumer)
- 2.6 describe the effect marketing decisions have on society; e.g., environmental concerns, cultural issues
- 2.7 differentiate between marketing and retail merchandising

**3. identify and analyze retail merchandising strategies used in the marketplace today**

- 3.1 analyze the role of technology in the evolution of retailing including:
  - 3.1.1 electronic banking; e.g., debit and credit cards
  - 3.1.2 home shopping
  - 3.1.3 scanners/universal product codes
  - 3.1.4 improved product quality
  - 3.1.5 just-in-time delivery
- 3.2 analyze and show examples of product merchandising strategies used to increase sales including:
  - 3.2.1 scrambled merchandising
  - 3.2.2 narrowing the product line
  - 3.2.3 sampling and product demonstrations
  - 3.2.4 shelf positioning; e.g., eye-level
  - 3.2.5 packaging; e.g., name, colour, size, pictures
  - 3.2.6 brand selection and identification

- 3.3 analyze and show examples of pricing merchandising strategies used to increase sales including:
  - 3.3.1 multiple pricing
  - 3.3.2 unit pricing on shelves
  - 3.3.3 warehouse pricing
  - 3.3.4 loss leaders
- 3.4 analyze and show examples of service merchandising strategies used to increase sales including:
  - 3.4.1 hours of operation
  - 3.4.2 franchising; e.g., dependable, consistent
  - 3.4.3 loyalty programs; e.g., points for purchases
  - 3.4.4 delivery, gift wrapping, installation or repair
  - 3.4.5 satisfaction guaranteed
- 3.5 analyze and show examples of place merchandising strategies used to increase sales including the:
  - 3.5.1 size of the store
  - 3.5.2 layout of the store; e.g., commonly purchased items placed around the perimeter of the store
  - 3.5.3 use of direct lighting to enhance products
- 3.6 analyze and show examples of promotional merchandising strategies used to increase sales including:
  - 3.6.1 visual merchandising; e.g., window displays, point-of-purchase displays
  - 3.6.2 posters and advertisements around the store that coordinate with promotional campaigns in the media
  - 3.6.3 shelf cards indicating specials
  - 3.6.4 packaging and labelling
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices



## **COURSE MAM1020: QUALITY CUSTOMER SERVICE**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students identify and describe the target customer and the selling floor, including sales and nonsales activities. They will demonstrate techniques required by employees in the field.

**Parameters:** Access to a school store is recommended but not required.

**Supporting Course:** MAM1010: Marketing & Management

**Outcomes:** The student will:

- 1. define target market**
- 2. identify and describe the components of a target market**
  - 2.1 identify and describe participants including:
    - 2.1.1 buyers
    - 2.1.2 users
    - 2.1.3 influencers
  - 2.2 identify demographics; e.g., age, sex, income, geographical location, education, ethnic origin, economic background
  - 2.3 identify psychographics; e.g., lifestyles including attitudes, interests and habits
- 3. identify target markets for a variety of products and/or services**
- 4. identify and describe a variety of consumer behaviours**
  - 4.1 describe basic needs and identify several examples
  - 4.2 describe secondary wants and identify several examples
  - 4.3 differentiate among recent purchases and indicate if they were needs or wants
  - 4.4 describe Maslow's hierarchy of needs and identify purchases made at each level
  - 4.5 identify and give examples of:
    - 4.5.1 rational buying motives
    - 4.5.2 emotional buying motives
  - 4.6 identify their buying motives on recent purchases
  - 4.7 explain the influences of income on purchases
  - 4.8 describe how advertising influences consumer purchases
  - 4.9 describe the attention, interest, desire, action (AIDA) concept and indicate its relationship to consumer behaviour
  - 4.10 identify influences on recent purchases
- 5. demonstrate effective retail sales and service techniques**
  - 5.1 demonstrate high standards of personal health, grooming and cleanliness
  - 5.2 demonstrate proper interaction and relationships with:
    - 5.2.1 customers
    - 5.2.2 coworkers
    - 5.2.3 supervisors
    - 5.2.4 suppliers
  - 5.3 differentiate between the role of a sales clerk/service provider and a salesperson
  - 5.4 describe or demonstrate how sales clerks obtain product knowledge

- 5.5 demonstrate quality customer service when:
  - 5.5.1 preparing sales receipts/bills
  - 5.5.2 dealing with various customer types
  - 5.5.3 handling customer complaints and returns
- 5.6 demonstrate use of proper approach; e.g., greeting, service, merchandise
- 5.7 demonstrate the ability to follow store policies and procedures
- 5.8 demonstrate upkeep and maintenance of a store
- 5.9 maintain well-stocked shelves
- 5.10 assist in preparing promotional campaigns including visual merchandising
- 5.11 demonstrate quality customer service skills as a cashier; e.g., using floats, cashing out, cash reconciliation, preparing store deposits
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 7.2 create a connection between a personal inventory and occupational choices

## **COURSE MAM1030: COMMUNICATION STRATEGIES 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students improve oral and written business communication skills necessary for efficient and effective management of information. The focus is on business writing strategies and composing memorandums, messages and business letters.

**Parameters:** Access to an appropriate computer work station, storage medium, word processing software, the Internet and supporting materials.

**Supporting Courses:** INF1030: Word Processing 1  
INF2090: Correspondence

**Outcomes:** The student will:

### **1. demonstrate use of the writing process when composing correspondence**

- 1.1 identify and describe the different types of business documents including:
  - 1.1.1 memorandums
  - 1.1.2 electronic messages; e.g., e-mails
  - 1.1.3 personal business letters
  - 1.1.4 business letters
  - 1.1.5 informal business reports
  - 1.1.6 form business reports
  - 1.1.7 proposals and press releases
- 1.2 outline and research the steps in the writing process; e.g., prewriting, composing, revising, proofreading
- 1.3 identify and use prewriting strategies when preparing messages and memorandums to:
  - 1.3.1 ensure good organization
  - 1.3.2 get to the point quickly
  - 1.3.3 supply accurate information
  - 1.3.4 indicate specific actions
- 1.4 differentiate between a personal business letter and a business letter
- 1.5 describe the functions of a business letter to:
  - 1.5.1 sell products or services
  - 1.5.2 request material or information
  - 1.5.3 answer customer inquiries or complaints
  - 1.5.4 increase goodwill
  - 1.5.5 act as a permanent record
  - 1.5.6 prepare a written contract
- 1.6 identify and use prewriting strategies when preparing personal business and business letters to:
  - 1.6.1 identify the purpose and audience
  - 1.6.2 identify what details need to be included
  - 1.6.3 complete any necessary research
  - 1.6.4 organize the letter using letter formulas
  - 1.6.5 outline the details of the letter in the order they should appear

- 1.7 describe strategies to use when planning to write business documents to:
  - 1.7.1 identify the main point
  - 1.7.2 identify the audience
  - 1.7.3 determine the type of document; e.g., letter, memorandum
  - 1.7.4 plan the message by listing points
  - 1.7.5 arrange points in logical order
- 1.8 select a letter format to use before writing
- 1.9 compose the first draft of the letter, including an opening, body and closing using a word processing program
- 1.10 identify and use revising strategies for a business letter
- 1.11 select a format to use before writing a memorandum or e-mail message
- 1.12 compose the first draft of the memorandum using a template
- 1.13 describe basic sentence structure, grammar, spelling and punctuation rules
- 1.14 identify and use revising strategies; e.g., check for brevity, active language and clarity
- 1.15 identify and use proofreading strategies to:
  - 1.15.1 proofread for facts, dates, names, figures and statistical information
  - 1.15.2 proofread for sentence structure, grammar, spelling, punctuation and format
- 2. demonstrate best practice when dealing with callers**
  - 2.1 describe effective oral communication strategies used in business
  - 2.2 describe the significance of nonverbal language
  - 2.3 correctly demonstrate making proper business introductions
  - 2.4 correctly demonstrate using proper communication etiquette when making/answering calls, during the calls and following the calls
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 4.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 4.2 create a connection between a personal inventory and occupational choices



**COURSE MAM1040: E-COMMERCE 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students will investigate the concept of e-commerce as a marketing strategy and design an e-commerce Web site to sell products and/or services.

**Note:** The e-commerce Web site that is designed does not need to be published on the Internet; it can be operational on a local machine/network, if necessary.

**Parameters:** Access to an appropriate computer work station, word processing software, Web site design software, the Internet and supporting materials.

**Supporting Courses:** INF1030: Word Processing  
MAM1010: Marketing & Management and/or any  
Web design course

**Outcomes:** The student will:

- 1. describe features, benefits and challenges influencing decisions to market online**
  - 1.1 list features that are typical of e-commerce Web sites including:
    - 1.1.1 a catalogue display that lists products and/or services for sale
    - 1.1.2 systems to handle orders, payments, shipping and inventory
    - 1.1.3 marketing and advertising initiatives to attract and retain customers
  - 1.2 describe the potential benefits of marketing online (e-commerce) including:
    - 1.2.1 higher revenue/income potential by: expanding business networks and affiliations, reducing overall labour, communication and inventory costs, exposing businesses to wider audiences; e.g., local, national, global,
    - 1.2.2 enhanced customer service; e.g., 24/7 access
    - 1.2.3 faster information dissemination to customers
    - 1.2.4 faster information dissemination on products and marketing efforts within the company
    - 1.2.5 increased goodwill and shareholder value
  - 1.3 identify and assess challenges to marketing online including:
    - 1.3.1 ethical issues; e.g., selling illegal items, using untrue, incomplete statements in advertising, accepting money for recommendations
    - 1.3.2 privacy concerns; e.g., managing the nature and degree of information collected on customers, selling or renting customer information to a third party without permission
  - 1.4 identify potential customers by demonstrating profile methods that include:
    - 1.4.1 age, gender, interests, occupations and income
    - 1.4.2 reading, writing and hearing abilities
    - 1.4.3 computer hardware and software expertise
    - 1.4.4 status of computer equipment; e.g., processing speed, screen size, wireless mobile devices
    - 1.4.5 connection speed to the Internet



## **2. outline the process of building an e-commerce Web site**

- 2.1 research the target market and determine if potential customers are online
- 2.2 determine what competitors are doing and what needs to be done to compete
- 2.3 estimate startup and ongoing fixed and variable costs by:
  - 2.3.1 listing what must be considered when deciding how to develop and manage an e-commerce Web site; e.g., expected size of Web site, expected traffic, need to connect to in-house business processes, levels of security needed
  - 2.3.2 describing alternatives for developing e-commerce Web sites; e.g., outsourcing, building own Web site
- 2.4 identify procedures for registering a domain name (Uniform Resource Locator or URL) that:
  - 2.4.1 is easy to find and remember
  - 2.4.2 is reflective of the Web site's content
  - 2.4.3 has a logical connection to the Web site's sponsor
  - 2.4.4 publishes pages to the Web site

## **3. design an e-commerce Web site to market products or services online**

- 3.1 describe and design the Web site and storyboard all Web pages, including the entire text for each Web page and the navigation links
- 3.2 create the Web site including:
  - 3.2.1 set up the background
  - 3.2.2 insert text
  - 3.2.3 format pages
  - 3.2.4 add hyperlinks
  - 3.2.5 develop forms
  - 3.2.6 insert images and special effects
  - 3.2.7 edit text-image interfacing
  - 3.2.8 review the impact of the layout, text and special effects
  - 3.2.9 test hyperlinks and navigation paths
- 3.3 gather opinions and feedback on impact and effectiveness and make necessary adjustments
- 3.4 market the Web site online and offline; e.g., search engines/directories and partnerships, news releases, stationery, advertisements
- 3.5 document the Web site by:
  - 3.5.1 listing items that need updating on a regular basis or that need to be changed seasonally
  - 3.5.2 creating a proposed schedule for software/hardware review

## **4. analyze content-related features of effective e-commerce Web sites**

- 4.1 examine the following:
  - 4.1.1 the home page
  - 4.1.2 the search function
  - 4.1.3 company information
  - 4.1.4 company policies on privacy, security and terms of business
  - 4.1.5 display format of products/services, ordering and shipping; e.g., shopping carts, payment options
- 4.2 examine forms to gather customer information and incentives to complete them
- 4.3 examine additional content, and accurate and appropriate text

## **5. analyze design- and technical-related features of effective e-commerce Web sites**

- 5.1 examine the overall impact of the Web site
- 5.2 examine if:
  - 5.2.1 the Web site aligns with potential customers' interests and needs
  - 5.2.2 pages are consistent in format, text size, font, headings and colour
  - 5.2.3 colour contrast helps items stand out or blend in and the background is effective

- 5.2.4 special effects have been added and are appropriate; e.g., pictures, photographs, graphics, sound, borders, audio, animation, video, marquee, 3-D graphics, 3-D animation
- 5.2.5 the home page provides clear links to other pages of the Web site
- 6. apply consistent and appropriate work station routines**
  - 6.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 6.2 employ practices that security for hardware, software, supplies and personal work
  - 6.3 apply effective decision-making strategies when using the Internet
  - 6.4 use related terminology to describe basic protocols, processes and tools
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 8.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 8.2 create a connection between a personal inventory and occupational choices



## **COURSE MAM1050: AGRICULTURE CONSUMER PRODUCTS & SERVICES**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students demonstrate the basic steps involved in processing or adding value to an agriculture commodity and/or in providing related services.

**Parameters:** Access to an agriculture processing industry and/or related services or information.

**Outcomes:** The student will:

- 1. explain the basic steps and procedures involved in processing an agriculture commodity and/or in providing a related service**
  - 1.1 identify steps that are followed in developing a consumer product or providing a related service including:
    - 1.1.1 inputs to the product or service
    - 1.1.2 processes and techniques
    - 1.1.3 safety, quality and environmental control
  - 1.2 explain relevant legislation and practices regarding identification, grading, packaging and labelling of the product or service
  - 1.3 describe strategies for ensuring the quality of the product or service; e.g., quality indicators, control measures
- 2. describe technological systems used to process a plant or animal commodity and/or to provide a related service**
  - 2.1 identify appropriate methods for transporting, storing, advertising and/or promoting the product or service
  - 2.2 describe buildings/structures and equipment appropriate to providing the product or service; e.g., design features, operation and maintenance, safety, economics/cost
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks

**4. make personal connections to the cluster content and processes to inform possible pathway choices**

- 4.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 4.2 create a connection between a personal inventory and occupational choices



## **COURSE MAM1910: MAM PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

#### **1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

#### **2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

#### **3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE MAM2010: MANAGING FOR QUALITY**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students demonstrate basic managerial skills, by assuming roles and responsibilities of management in order to coordinate available resources and achieve quality results.

**Parameters:** No specialized equipment or facilities.

**Supporting Course:** MAM1010: Marketing & Management

**Outcomes:** The student will:

- 1. identify and outline quality management systems and strategies used to improve quality**
  - 1.1 describe the role of the customer in managing for quality
  - 1.2 describe the role of front line employees in managing for quality
  - 1.3 describe how groups/teams can be used effectively
  - 1.4 describe decision-making processes when working in teams
  - 1.5 describe how quality is measured
  - 1.6 explain similarities and differences in forecasting/planning at the three management levels of strategic, tactical and operational
- 2. analyze the roles of managers and strategies used by managers to improve quality**
  - 2.1 describe the role of managers in managing for quality
  - 2.2 research monitoring as a basic management role and elaborate on the importance of monitoring for quality
  - 2.3 explain how technology can be used to help monitor data, information and organizational activities
  - 2.4 describe how a manager can deal effectively with conflict resolution
- 3. apply management systems and strategies**
  - 3.1 use quality management systems and strategies in a group environment
  - 3.2 evaluate current management systems and strategies used by managers to increase quality
  - 3.3 compare management planning with team planning
  - 3.4 compare directing with facilitating
  - 3.5 explain how people working for a common objective can be organized for efficiency
  - 3.6 describe and provide examples of:
    - 3.6.1 organizational charts
    - 3.6.2 centralized versus decentralized control
    - 3.6.3 power, authority, responsibility, accountability and delegation
  - 3.7 describe ethical issues of monitoring and control of employees
- 4. identify, through research, a current management system and describe its effect on the organization**
  - 4.1 research “planning” as one of the basic management roles and elaborate on the importance of planning for quality in:
    - 4.1.1 establishing objectives
    - 4.1.2 developing a mission statement and setting goals
    - 4.1.3 determining how objectives will be met

- 4.2 explain why contingency planning is vital
- 4.3 research “organizing” as one of the basic management roles and elaborate on its importance for quality
- 4.4 research “leadership” as a basic management role and elaborate on its importance for quality
- 4.5 describe the different styles of leadership
- 4.6 compare controlling with empowering
- 4.7 compare and contrast power and authority, and explain their relationship
- 4.8 describe motivations and factors that affect individual motivational levels including:
  - 4.8.1 individual difference; e.g., attitudes, needs
  - 4.8.2 job characteristics; e.g., task and its significance, skill levels, autonomy, feedback, communication
  - 4.8.3 organizational policies and practices; e.g., rules, intrinsic and extrinsic rewards
- 4.9 describe how effective leaders influence others to act including how to:
  - 4.9.1 share influences and motivate individuals
  - 4.9.2 match individual aspirations with organization goals
  - 4.9.3 apply intuition, anticipate change, assess and respond
  - 4.9.4 vision; e.g., identify different/better ways of proceeding
  - 4.9.5 recognize self-understanding; e.g., recognize one’s own strengths and weaknesses
- 4.10 compare the types of groups that exist in an organization and explain how group development and processes can be encouraged
- 4.11 research “communicating” as a basic management role and elaborate on its importance for quality and the relationship between communication, action and quality results
- 4.12 identify reasons for conflict and stress
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MAM2030: VISUAL MERCHANDISING**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students identify different types of visual merchandising and describe how to construct attention-getting displays and evaluate visual merchandising.

**Parameters:** No specialized equipment or facilities.

**Supporting Course:** MAM1010: Marketing & Management

**Outcomes:** The student will:

### **1. identify and explain basic visual merchandising concepts**

- 1.1 describe what visual merchandising is and provide examples, illustrations and/or pictures of various displays/presentations
- 1.2 explain how displays/visual presentations can influence the customer; e.g., route traffic, catch attention, expand window theme, create a pleasant store environment, result in quick product identification, entice entry into store, reinforce store image, support sales presentations
- 1.3 describe the different types of visual merchandising presentations and provide examples for the following:
  - 1.3.1 interior; e.g., open such as gondola, shelving, racks, ledge or platform; closed such as showcases, shadow boxes, architectural or built-up displays
  - 1.3.2 exterior; e.g., closed, semi-closed, open
  - 1.3.3 season; e.g., pre-season, runner, clearance
- 1.4 demonstrate how interior presentations can be coordinated with exterior presentations
- 1.5 describe how ideas are generated for visual merchandising
- 1.6 list visual presentation ideas for a variety of events and themes
- 1.7 identify and describe the elements of design as they relate to visual merchandising including:
  - 1.7.1 use of lines; e.g., vertical, horizontal, curve, diagonal
  - 1.7.2 use of shape; e.g., geometric, organic, positive, negative
  - 1.7.3 use of colour; e.g., terminology, schemes, moods
  - 1.7.4 background
  - 1.7.5 use of three-dimensional space
  - 1.7.6 use of weight, size and texture
- 1.8 identify and describe the principles of design as they relate to visual merchandising including:
  - 1.8.1 patterns; e.g., interface, staircase, gradation, pyramid, zigzag, repetition, radiation
  - 1.8.2 formal and informal balance
  - 1.8.3 harmony and contrast
  - 1.8.4 rhythm
  - 1.8.5 proportion
  - 1.8.6 emphasis
  - 1.8.7 unity

### **2. create a collection of visual merchandising ideas for a calendar year**



**3. design and construct a visual merchandising presentation**

3.1 apply basic guidelines when creating visual presentations including:

- 3.1.1 use the “Keep it Simple” concept
- 3.1.2 keep the customer’s viewpoint in mind
- 3.1.3 use lighting to enhance the display
- 3.1.4 use props to enhance the merchandise and theme

3.2 apply the steps in planning a visual presentation including:

- 3.2.1 identify the objective
- 3.2.2 select the theme, merchandise and location
- 3.2.3 compute the cost of constructing the presentation
- 3.2.4 assemble the supplies and materials needed
- 3.2.5 prepare the display area, merchandise and props
- 3.2.6 construct the visual presentation
- 3.2.7 maintain the display

**4. evaluate various forms of visual merchandising**

4.1 evaluate the effectiveness of the visual presentation according to:

- 4.1.1 location
- 4.1.2 design
- 4.1.3 theme
- 4.1.4 impact and appeal

4.2 recommend possible changes to the process of creating the presentation and to the display itself

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

6.1 recognize and then analyze the opportunities and barriers in the immediate environment

6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MAM2040: RETAIL OPERATIONS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students identify and demonstrate retail operations that are typically performed off the selling floor and/or away from customers.

**Parameters:** No specialized equipment or facilities.

**Supporting Courses:** MAM1010: Marketing & Management  
MAM1020: Quality Customer Service

**Outcomes:** The student will:

- 1. identify and report on a particular retailer's policies and practices**
  - 1.1 research and report on policies for a variety of retail stores including:
    - 1.1.1 sales and services
    - 1.1.2 credit and collection
    - 1.1.3 store security
    - 1.1.4 human resources
    - 1.1.5 recordkeeping
- 2. act as a buyer when purchasing goods and demonstrate ordering procedures**
  - 2.1 describe the duties of a buyer
  - 2.2 identify how goods are classified including:
    - 2.2.1 type of goods; e.g., convenience, impulse, shopping specialty, staple
    - 2.2.2 brand names; e.g., national, private, generic
  - 2.3 identify and discuss the product and fashion life cycle
  - 2.4 research buying data and/or sources including:
    - 2.4.1 supplier information, sources and reputation
    - 2.4.2 product classification, price and availability
  - 2.5 use purchase order or requisition forms when buying goods
  - 2.6 explain what the following shipping terms mean and what impact they have on the buyer:
    - 2.6.1 freight on board (FOB) factory
    - 2.6.2 FOB destination
    - 2.6.3 FOB shipping point
- 3. develop a checking, marking and stocking system to use after goods have been received**
  - 3.1 describe procedures and methods used for receiving goods; e.g., receiving, checking, storage, stocking
  - 3.2 analyze what remedies the buyer has or what actions can be taken for:
    - 3.2.1 damage or breakage
    - 3.2.2 substitution or poor quality
    - 3.2.3 overage or shortage
    - 3.2.4 lost or misplaced order

- 4. verify and process invoices for payment of goods and services received**
  - 4.1 verify the accuracy of invoices
  - 4.2 identify the different types of discounts available to retailers
  - 4.3 calculate discounts and the net totals of invoices
  - 4.4 record the purchases of goods received
  - 4.5 pay invoices by cheque or cheque requisition
- 5. describe pricing strategies used by retailers**
  - 5.1 calculate the markup of goods based on cost and retail price
  - 5.2 calculate the break-even point
  - 5.3 identify and discuss what type of price tags should be used
  - 5.4 identify pertinent information to be included in price tags including cost codes
  - 5.5 identify how and when goods are marked down
  - 5.6 calculate the markdown of goods
  - 5.7 describe the application and effect of pricing policies including:
    - 5.7.1 market penetration; e.g., low entry
    - 5.7.2 skimming; e.g., high entry
    - 5.7.3 comparable; e.g., competitive range
    - 5.7.4 flexible; e.g., one-price, variable
    - 5.7.5 relative; e.g., desired level
- 6. demonstrate effective use of systems and strategies to control goods**
  - 6.1 identify the different methods of inventory control available
  - 6.2 demonstrate the use of various methods
  - 6.3 explain and calculate stock turnover
  - 6.4 describe stocking and storage consideration from the buyer's perspective when orders are received:
    - 6.4.1 for the sales floor
    - 6.4.2 as backup stock off the selling floor
    - 6.4.3 for the warehouse
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. identify possible life roles related to the skills and content of this cluster**
  - 8.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 8.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MAM2050: OFFICE SYSTEMS 1**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students identify and describe strategies and procedures in the office environment and how to manage processes and protocols related to equipment, written communication transmittal and business travel arrangements.

**Parameters:** Access to office equipment.

**Supporting Course:** MAM1030: Communication Strategies 1

**Outcomes:** The student will:

- 1. identify strategies and procedures employed in an office environment**
  - 1.1 research how various business offices are organized with respect to:
    - 1.1.1 organizational structure
    - 1.1.2 priorities/philosophy
    - 1.1.3 design and layout
  - 1.2 identify the components of a work area including:
    - 1.2.1 hardware
    - 1.2.2 software
    - 1.2.3 telecommunications
    - 1.2.4 resources/references
    - 1.2.5 ergonomics
  - 1.3 describe how the office supports a commitment to quality management by:
    - 1.3.1 focusing on the customer
    - 1.3.2 ensuring accuracy, completeness and simplicity
    - 1.3.3 using references/research
  - 1.4 identify and assess strategies that increase personal productivity including:
    - 1.4.1 time and work management
    - 1.4.2 setting priorities
    - 1.4.3 resource management
  - 1.5 demonstrate proper personal grooming and dress appropriate to the office environment
- 2. demonstrate use of equipment within the office environment**
  - 2.1 use a variety of office equipment
  - 2.2 research issues related to ethics and laws regarding the use of office equipment
- 3. develop procedures for managing written communication transmittals**
  - 3.1 research communication strategies and procedures for small and large businesses
  - 3.2 research services available for transmitting documents including:
    - 3.2.1 various classes of mail
    - 3.2.2 special services
    - 3.2.3 other carriers available; e.g., private couriers and messenger services
  - 3.3 analyze the effect of technology and communication terminals on transmission of written documents

**4. make travel arrangements for a business trip**

- 4.1 gather the necessary information to arrange a business trip including:
  - 4.1.1 how to handle bookings and reservations
  - 4.1.2 mode of transportation
  - 4.1.3 accommodations
- 4.2 describe the special arrangements necessary when travel internationally
- 4.3 prepare budgets and expense claims for business trips
- 4.4 prepare itineraries for business trips

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MAM2060: COMMUNICATION STRATEGIES 2**

**Level:** Intermediate

**Prerequisite:** MAM1030: Communication Strategies 1

**Description:** Students improve their basic oral and written communication strategies necessary for efficient and effective management of information. The focus is on technical writing strategies and composing when preparing informal business reports and proposals.

**Parameters:** Access to appropriate computer work station, word processing software and support materials.

**Supporting Course:** INF2100: Reports

**Outcomes:** The student will:

### **1. critique informal business reports**

1.1 identify, analyze and revise reports according to:

- 1.1.1 proper focus
- 1.1.2 completeness
- 1.1.3 logical conclusions and recommendations
- 1.1.4 inconsistencies or contradictions

1.2 identify and use proofreading strategies to:

- 1.2.1 proofread for facts, dates, names, figures and statistical information
- 1.2.2 proofread for sentence structure, grammar, spelling, punctuation and format

### **2. demonstrate use of the writing process, e.g., prewriting, writing, revising, proofreading, when composing business reports or proposals**

2.1 research the types of business situations that require technical reports including:

- 2.1.1 an investigative report with an analysis of a particular problem
- 2.1.2 an evaluation of an existing situation or a proposed action
- 2.1.3 a response to a situation or incident
- 2.1.4 progress being made on a long-term project
- 2.1.5 a proposal that persuades the reader to adopt a change

2.2 compare and distinguish between the need for informal and formal reports in business environments considering:

- 2.2.1 situation
- 2.2.2 audience
- 2.2.3 details of investigation

2.3 compare the characteristics between informal and formal writing including:

- 2.3.1 writing styles
- 2.3.2 length and layout

2.4 research and use prewriting strategies when preparing informal reports including:

- 2.4.1 identify the purpose
- 2.4.2 list key points
- 2.4.3 discuss findings

- 2.5 outline the sections of an informal report including:
  - 2.5.1 summary
  - 2.5.2 introduction
  - 2.5.3 discussion
  - 2.5.4 conclusion(s)
  - 2.5.5 recommendations
  - 2.5.6 appendices; e.g., charts, supporting data, diagrams
- 2.6 draft the informal report using the following strategies:
  - 2.6.1 write in an unbiased manner
  - 2.6.2 substantiate opinions
  - 2.6.3 be specific
  - 2.6.4 construct and attach any appendices
- 3. deliver an oral report, using effective communication strategies**
  - 3.1 give oral instructions in person or on a recording to enable another person to complete a specified task
  - 3.2 receive instructions from a person or on a recording and develop a plan to complete a specified task
  - 3.3 rehearse a prepared oral or written report on a business topic using effective oral communication strategies
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MAM2080: RECORDS MANAGEMENT 1**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students evaluate and demonstrate basic records management skills for a manual records system, emphasizing alphabetic coding procedures.

**Parameters:** Access to a manual records system.

**Outcomes:** The student will:

- 1. evaluate and make recommendations for improving the quality of the office environment**
  - 1.1 research the change process within an office as electronic technologies alter the office environment
  - 1.2 analyze the changing role of the office worker at different levels; e.g., entry-level, supervisory, top-level management
  - 1.3 research various job descriptions; e.g., responsibilities (direct, indirect), setting priorities, reporting structure, opportunities for initiative
  - 1.4 illustrate the flow of work for one or more office functions
  - 1.5 compare office manuals for common policies and procedures
  - 1.6 propose strategies by which an office could improve the commitment to quality management
  - 1.7 implement strategies that increase personal productivity including:
    - 1.7.1 time and work management
    - 1.7.2 setting priorities
    - 1.7.3 resource management
- 2. demonstrate independent use of office strategies and procedures and of electronic office equipment including procedures for electronic communications**
  - 2.1 apply efficient communication procedures and protocols when using a variety of electronic office equipment
  - 2.2 describe the various communication systems available to a business; e.g., telephone, voice messaging systems, electronic mail, facsimiles, the Internet, teleconferencing
  - 2.3 research a variety of communication procedures and protocols that are practised for each system; e.g., answering phones promptly, delivering fax messages promptly, answering electronic mail messages immediately
  - 2.4 identify strategies to develop skills and train others on a variety of electronic office equipment
  - 2.5 follow ethics and laws regarding the use of electronic office equipment
  - 2.6 demonstrate proper personal grooming and dress appropriate to the office environment
- 3. demonstrate ability to plan and run a business meeting**
  - 3.1 identify procedures when planning a meeting, including in formal and informal settings
  - 3.2 describe strategies to prepare for the meeting
  - 3.3 describe how meetings run effectively and efficiently
  - 3.4 describe procedures to follow after the meeting
  - 3.5 plan and simulate a business meeting

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MAM2090: PROMOTION: PRINT ADVERTISING**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students are introduced to communication channels, delivery strategies and advertising media that can be used to inform potential customers about products and services available in the marketplace.

**Parameters:** Access to a computer work station, with graphics software, is recommended for print advertising.

**Supporting Courses:** COM1020: Media & You  
MAM1010: Marketing & Management

**Outcomes:** The student will:

- 1. describe principles involved in the advertising process and apply these principles to print media**
  - 1.1 explain what advertising is and what purpose it serves
  - 1.2 differentiate between publicity and advertising
  - 1.3 describe the various criticisms, controversies, laws and ethics regarding advertising
- 2. evaluate print advertisements**
  - 2.1 provide examples that illustrate a variety of target markets for the following types of advertisements; e.g., consumer products, consumer services, business products, business services, advocacy (institutional) advertising
  - 2.2 describe a variety of objectives that marketers use when developing advertising campaigns
  - 2.3 provide specific examples of geographical promotional strategies; e.g., local, regional, national, international
  - 2.4 identify and provide examples of various print and broadcast media and describe the advantages and disadvantages of each
  - 2.5 identify and analyze components of a print advertisement; e.g., borders, headline(s), illustrations or graphics, copy, logo (signature)
  - 2.6 compare costs in relation to return on investment; e.g., audience versus cost of creating/producing and placing advertisement
- 3. design and create an effective print advertisement**
  - 3.1 explain the steps in planning a print advertisement including:
    - 3.1.1 determine the form of print media; e.g., billboard, flyer, poster
    - 3.1.2 state the objective
    - 3.1.3 define the target audience
    - 3.1.4 select the buying motive; e.g., use of the Unique Selling Proposition (USP)
  - 3.2 demonstrate the use of effective layout arrangements such as:
    - 3.2.1 use of borders
    - 3.2.2 use of white space
    - 3.2.3 use of different fonts
    - 3.2.4 placement of the various components



- 3.3 present and evaluate own print advertisement to teacher and/or peers
- 3.4 create and present a portfolio of work completed in this course or add this work to an existing portfolio
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MAM2110: E-COMMERCE 2**

**Level:** Intermediate

**Prerequisite:** MAM1040: E-Commerce 1

**Description:** Students will enhance their understanding of e-commerce as a marketing strategy and design an e-commerce Web site with special effects and additional content to attract customers and increase customer satisfaction.

**Note:** The e-commerce Web site that is designed does not need to be published on the Internet; it can be operational on a local machine/network, if necessary.

**Parameters:** Access to an appropriate computer work station, word processing, Web site design software, the Internet and support materials.

**Supporting Courses:** ENT2030: Marketing the Venture  
Web Design course  
Multimedia Authoring course  
Electronic Publishing course

**Outcomes:** The student will:

### **1. describe strategies that attract customers to an e-commerce Web site**

- 1.1 outline Web site improvements that encourage customers to visit the e-commerce Web site including:
  - 1.1.1 additional content
  - 1.1.2 special effects
  - 1.1.3 navigation methods
- 1.2 identify how Web sites can provide superior customer service by:
  - 1.2.1 keeping the Web site up-to-date and indicating “What’s New”
  - 1.2.2 providing detailed product information including side-by-side charts comparing the company’s products to its competitors’ products, a database allowing online shoppers to investigate products in-depth and showing products in a favourable light
  - 1.2.3 providing the ability to trace the status of orders; e.g., in-house database or connect to shipper’s database
  - 1.2.4 establishing and/or refining company policies for returns, security and privacy
  - 1.2.5 providing access to staff e-mail addresses to route customer questions to correct departments
  - 1.2.6 using distribution lists to send copies of one message to numerous customers or employees; e.g., flag problems, share good news
  - 1.2.7 providing incentives (added value) for customers to buy or register through the Web site; e.g., sales, discounts, quizzes, contests
  - 1.2.8 providing the option to customize the home page
  - 1.2.9 providing links to free information; e.g., current news, stock prices

- 1.3 demonstrate current best practice when developing the Web site; e.g., accessibility, World Wide Web Consortium (W3C) standards
- 1.4 describe benefits of strategic partnerships, including that the partner:
  - 1.4.1 can offer quality information and/or online services that complement the products/services on the e-commerce Web site
  - 1.4.2 can provide high-quality and credible information on the products/services available through the e-commerce Web site
  - 1.4.3 can generate income based on hits and/or purchases
  - 1.4.4 is willing to place advertisements on its Web site; e.g., usually free
- 1.5 list various ways that an e-commerce business can advertise on partners' Web sites; e.g., banner ads, name identifiers
- 1.6 list methods of paying for purchases online including:
  - 1.6.1 credit and debit cards
  - 1.6.2 electronic cash; e.g., e-cheques, smart card, electronic wallet
- 1.7 chart advantages and disadvantages of different arrangements for handling payment systems securely including:
  - 1.7.1 terminal identification
  - 1.7.2 digital certificates
  - 1.7.3 digital signatures
  - 1.7.4 encryption
  - 1.7.5 protocols for secure information transfer through the Internet
- 2. describe ethical issues, security threats and current legislation related to e-commerce**
  - 2.1 outline examples of how an e-commerce Web site could deal with ethical issues and other challenges; e.g., unsolicited mail, online activism, access for people with disabilities
  - 2.2 describe security threats and potential solutions; e.g., virus attacks, password guessing, credit card fraud, spoofing (intruder appears to be someone else), denial of service attacks (crashing system, using up resources, flooding network with bogus requests), sniffing (grabbing passwords by monitoring network traffic), operating system exploitation (bugs or known flaws that allow entry), phishing
  - 2.3 summarize key features of legislation and tort law that impact e-commerce; e.g., electronic contracts, intellectual property law, copyright, patents, trademarks, domain registration
- 3. analyze content-related features of effective e-commerce Web sites**
  - 3.1 examine if:
    - 3.1.1 the home page shows the main components of the Web site effectively
    - 3.1.2 the search function allows efficient access to information
    - 3.1.3 company information is included; e.g., name of company, address, telephone number, fax number, e-mail contact, list of key personnel, video of key staff
    - 3.1.4 company policies on privacy, security and terms of business are clearly stated
    - 3.1.5 products and services are effectively displayed; e.g., name, code, description, price, option to buy, link to shopping cart, detailed product information
    - 3.1.6 the shopping cart indicates purchase name, code, price, discount, shipping cost, taxes and total cost
    - 3.1.7 the shopping cart provides options to delete the purchase(s), continue shopping or check out with a link to shipping choices
    - 3.1.8 the shipping choices (courier, postal service, bus, rail, air, truck) and costs are clear and there is a link to payment choices
    - 3.1.9 the payment choices are clear; e.g., credit card, debit card, electronic cash
    - 3.1.10 forms to gather customer information are well-designed
    - 3.1.11 incentives to register are clear and attract attention
    - 3.1.12 drop-down menus assist in filling out forms

- 3.1.13 additional content is offered to attract customers; e.g., detailed product/service information, frequently asked questions, “What’s New,” newsroom, forum, Web site tour, thank-you page, games
- 3.1.14 text is appropriate for potential customers
- 3.1.15 text is accurate; e.g., no errors in spelling, punctuation, grammar
- 4. analyze design- and technical-related features of effective e-commerce Web sites**
  - 4.1 examine if:
    - 4.1.1 special effects have been added and are appropriate; e.g., pictures, photographs, graphics, sound, borders, audio, animation, video, marquee, 3-D graphics, 3-D animation
    - 4.1.2 the home page provides clear links to other pages of the Web site
    - 4.1.3 navigation methods are effective; e.g., menus, bars, links such as text, icon, banner ad, hover button, image map
    - 4.1.4 navigation throughout the Web site is efficient; e.g., three or fewer “clicks”
    - 4.1.5 after the home page, navigation links are positioned in a standard location
    - 4.1.6 the organization of information is efficient; e.g., least used at “back” of Web site
    - 4.1.7 the processing speed is acceptable throughout the Web site
    - 4.1.8 the domain name (URL) is indicative of the products/services offered
    - 4.1.9 viewers have the option to register and the ability to ask questions, request information and give feedback
    - 4.1.10 viewers have the option to control viewing choices; e.g., text only, view videos, turn off sound, enlarge/reduce picture size, customize the home page, select language
- 5. design an e-commerce Web site with special effects and additional content**
  - 5.1 complete the process of building an e-commerce Web site by:
    - 5.1.1 planning the Web site
    - 5.1.2 developing the Web site including content-related features and design- and technical-related features
    - 5.1.3 testing and presenting the Web site
    - 5.1.4 modifying and publishing the Web site
- 6. apply consistent and appropriate work station routines**
  - 6.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
  - 6.2 employ practices that security for hardware, software, supplies and personal work
  - 6.3 apply effective decision-making strategies when using the Internet
  - 6.4 use related terminology to describe basic protocols, processes and tools
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems



- 7.2 demonstrate personal management skills to:
  - 7.2.1 demonstrate positive attitudes and behaviours
  - 7.2.2 be responsible
  - 7.2.3 be adaptable
  - 7.2.4 learn continuously
  - 7.2.5 work safely
- 7.3 demonstrate teamwork skills to:
  - 7.3.1 work with others
  - 7.3.2 participate in projects and tasks
- 8. identify possible life roles related to the skills and content of this cluster**
  - 8.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 8.2 identify potential resources to minimize barriers and maximize opportunities



**COURSE MAM2130: ENERGY & RESOURCES SUPPLY & DISTRIBUTION**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students research marketing and distribution networks within an energy or mineral industry; examine regulatory structures and policies that influence supply of a commodity, product or service; and describe related career opportunities.

**Parameters:** Access to relevant distribution and marketing facilities.

**Supporting Course:** ENM1060: Consumer Products & Services

**Outcomes:** The student will:

- 1. explain marketing and distribution systems used within an energy or mineral industry**
  - 1.1 identify key local, national and global markets and destinations for an energy or mineral resource
  - 1.2 explain major functions of marketing within an energy or mineral industry; e.g., market survey and research, product and/or service planning, advertising and promotion, price determination, sales
  - 1.3 represent the basic stages through which a product moves en route to market; e.g., recovery and production, processing and refining, product brokering, transport
  - 1.4 explain the laws of supply and demand and factors that cause changes in supply and demand for a commodity, product or service; e.g., trade regulations, economic conditions, environmental concerns, consumer trends, new technology
  - 1.5 identify basic price determinants and trends for a commodity, product or service; e.g., product characteristics, balance between supply and demand, inflation and dollar value, political instability, storage and/or distribution costs
  - 1.6 research one or more distribution networks within the energy or mineral industry used to move a commodity or product to market; e.g., pipeline systems, tankers and barges, rail and trucking systems, power grid
  - 1.7 explain the function of intermediate stops in moving a commodity or product to market
  - 1.8 identify safety and environmental standards and emergency response plans relevant to transporting an energy or mineral product
- 2. describe regulatory structures and policies that influence supply of a commodity, product or service**
  - 2.1 explain the concept of supply management and differences between nonregulated (open) and regulated (closed) market systems; provide examples of open and closed market systems
  - 2.2 explain the role and impact of regulatory systems and strategies used in marketing a commodity, product or service; e.g., marketing boards, cooperatives, quota systems, monopolies
  - 2.3 describe local and global marketing structures used to facilitate commodity exchange and establish benchmark prices
  - 2.4 evaluate the impact of government policies and legislation on marketing activities within an energy or mineral industry; e.g., provincial, national and international trade agreements, deregulation and free trade, transportation policies and safety and environmental standards

- 2.5 describe the mandates of provincial, national and foreign agencies in regulating exchange of a commodity, product or service; e.g., Alberta Petroleum Marketing Commission, National Energy Board, Organization of the Petroleum Exporting Countries (OPEC), California Gas Transmission Commission
- 2.6 identify and evaluate viable alternatives for marketing within an energy or mineral industry; e.g., direct producer marketing, open markets, marketing boards, cooperatives
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. identify possible life roles related to the skills and content of this cluster**
  - 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 4.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE MAM2910: MAM PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE MAM2920: MAM PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MAM3010: THE BUSINESS ORGANIZATION**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students identify and describe organizational structures, management theories and organizations as working units. Students also explain their beliefs of what successful organizations might look like in the future.

**Parameters:** No specialized equipment or facilities.

**Supporting Courses:** MAM1010: Marketing & Management  
MAM2010: Managing for Quality

**Outcomes:** The student will:

- 1. analyze and describe local examples of different types of organizational structures**
  - 1.1 analyze the types of organizational structures including:
    - 1.1.1 functional; e.g., organized by functions
    - 1.1.2 line and staff; e.g., organized by product line
    - 1.1.3 geographical; e.g., organized by region
    - 1.1.4 committee and matrix; e.g., organized by teams
  - 1.2 diagram a firm's organization for each type of structure
  - 1.3 research the levels of management in the managerial hierarchy for each structure
  - 1.4 describe the channels of communications and flow of information for a variety of organizations
- 2. analyze the different management theories and forecast future trends**
  - 2.1 research and critique popular theories of management including:
    - 2.1.1 classical
    - 2.1.2 scientific management
    - 2.1.3 management by objectives
    - 2.1.4 management by wandering around
    - 2.1.5 Japanese model
    - 2.1.6 total quality management
    - 2.1.7 site-based management
    - 2.1.8 future trends
  - 2.2 research the best organizational structure(s) to use for each theory
  - 2.3 research the theory or combination of theories that best fit the needs of today's society
- 3. examine the purpose of functional areas in a business organization and the roles and responsibilities for managers in each of the areas**
  - 3.1 research management roles in functional areas and explain management tasks and responsibilities in:
    - 3.1.1 research and development
    - 3.1.2 production and manufacturing
    - 3.1.3 finance and accounting
    - 3.1.4 marketing
    - 3.1.5 purchasing
    - 3.1.6 administration
    - 3.1.7 human resources

- 3.2 explain how each function fits within the organization, identifying key components of the function and characteristics of successful and/or effective members
- 4. **identify why businesses succeed or fail and how organizations measure their success or failure**
  - 4.1 identify common reasons why organizations succeed or fail
  - 4.2 describe how an organization can rate its success
  - 4.3 describe how performance can be measured and recognized; e.g., owner, manager, support team
- 5. **evaluate a current challenge facing managers in today's society**
  - 5.1 identify and analyze ethical challenges that affect organizations and personnel including:
    - 5.1.1 interpersonal interactions
    - 5.1.2 company policies and protocols
    - 5.1.3 customers interactions
    - 5.1.4 business associates and competitors
  - 5.2 describe examples of how social responsibility has been addressed or not addressed by an organization
- 6. **demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. **create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE MAM3020: BUSINESS IN THE CANADIAN ECONOMY**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students investigate and relate their knowledge of economics to how business decisions are made within the community, provincially, nationally and internationally.

**Parameters:** No specialized equipment or facilities.

**Supporting Courses:** MAM1010: Marketing & Management  
MAM2010: Managing for Quality

**Outcomes:** The student will:

### **1. identify and describe basic economic terms and concepts**

- 1.1 describe the important role of economics in our personal lives
- 1.2 analyze how scarcity affects choices made by the individual and society
- 1.3 describe how all choices are “trade-offs” or “opportunity costs”
- 1.4 cite examples of opportunity costs
- 1.5 describe the factors of production; e.g., land, labour, capital
- 1.6 evaluate goods and services within the community and determine who produces and consumes them
- 1.7 analyze the interrelationship of consumers and producers and how decisions are made
- 1.8 explain key economic indicators for the following:
  - 1.8.1 gross domestic product (GDP)
  - 1.8.2 personal income
  - 1.8.3 consumer price index
  - 1.8.4 unemployment rates
  - 1.8.5 stock/bond markets
- 1.9 compare the following different types of economic systems listing the characteristics, advantages and disadvantages of each:
  - 1.9.1 market
  - 1.9.2 command
  - 1.9.3 mixed
- 1.10 research the laws of supply and demand by:
  - 1.10.1 analyzing the effects of supply and demand on price in a variety of market scenarios
  - 1.10.2 identifying recent examples of how the market has made adjustments to price and supply of various goods and services

### **2. demonstrate knowledge of the Canadian economy**

- 2.1 research the various economic goals at the federal, provincial and local level
- 2.2 explain the role of profit in our mixed economy
- 2.3 research the circular flow of our economy and its effects on:
  - 2.3.1 consumers
  - 2.3.2 government
  - 2.3.3 business
  - 2.3.4 GDP

- 2.4 describe how the business cycle fluctuates and responds to fluctuations
- 2.5 explain actions the government might take to stabilize our economy
- 2.6 explain how income is earned and spent
- 2.7 describe the role of the Bank of Canada and other banking institutions in determining interest rates and the relationship interest rates have on items such as purchases and investments
- 3. identify, describe and evaluate an economic issue challenging Canadian businesses**
  - 3.1 identify key issues that challenge Canadian business at community, regional, provincial, national and international levels
  - 3.2 conduct in-depth research on a key issue and report the findings
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE MAM3030: BUSINESS IN THE GLOBAL MARKETPLACE**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students examine the opportunities and challenges that confront business persons in establishing a global business operation.

**Parameters:** No specialized equipment or facilities.

**Supporting Courses:** MAM1010: Marketing & Management  
MAM2010: Managing for Quality  
MAM3020: Business in the Canadian Economy

**Outcomes:** The student will:

- 1. compare existing international business ventures within developing and developed nations**
  - 1.1 explain global marketplace terms
  - 1.2 identify and describe a variety of international businesses including:
    - 1.2.1 their organizational structures
    - 1.2.2 manager roles and responsibilities for foreign companies in Canada
    - 1.2.3 Canadian companies abroad
  - 1.3 describe the pros and cons of various forms of international business opportunities
- 2. identify and examine existing legislation that affects global ventures**
  - 2.1 research existing provincial legislation/regulations that promote or hinder trade within Canada
  - 2.2 research Canadian and other national legislation/regulations that promote or hinder trade with Canada
  - 2.3 identify and explain the following:
    - 2.3.1 World Trade Organization (WTO)
    - 2.3.2 Canada-United States Free Trade Agreement (FTA)
    - 2.3.3 North American Free Trade Agreement (NAFTA)
    - 2.3.4 European Economic Community (EEC)
    - 2.3.5 Pacific Rim
    - 2.3.6 other international trading agreements
  - 2.4 describe a protectionism policy and the historical effect it has had on countries
  - 2.5 describe and/or debate Canada/US actions regarding:
    - 2.5.1 tariffs; e.g., import and export tax
    - 2.5.2 dumping
  - 2.6 illustrate an organizational chart with the functions, duties, descriptions and examples of:
    - 2.6.1 an export department
    - 2.6.2 an export manager
    - 2.6.3 a commission agent
  - 2.7 research the role of the World Bank in international business
  - 2.8 describe the basic concepts of international trade from a fiscal and economic position including:
    - 2.8.1 balance of trade
    - 2.8.2 balance of payments
    - 2.8.3 exchange rate; e.g., floating, devaluation, revaluation
    - 2.8.4 counter trade

### **3. analyze existing global ventures**

- 3.1 describe the global competitive forces being exerted on the Canadian business community
- 3.2 explain how a Canadian business operation might determine its niche in the international marketplace
- 3.3 research and summarize how management organizes for an effective international strategy by:
  - 3.3.1 developing new products/services
  - 3.3.2 maximizing advanced technology capability; e.g., communication, research, production
  - 3.3.3 using resources from the local community
  - 3.3.4 identifying local economic, political, social and environmental issues
  - 3.3.5 clarifying profit targets
- 3.4 research and explain possible involvement opportunities on the international business scene, identifying examples and management's role in:
  - 3.4.1 exporting
  - 3.4.2 importing; e.g., directly/indirectly
  - 3.4.3 licensing; e.g., licensee/licenser
  - 3.4.4 franchising; e.g., franchisee/franchiser
  - 3.4.5 foreign marketing
  - 3.4.6 foreign production and marketing

### **4. identify and investigate global entrepreneurial opportunities within a developing and a developed nation**

- 4.1 describe the concept of “profit with principles” when doing business with developing nations
- 4.2 research and assess managerial considerations of the following conditions in a foreign country:
  - 4.2.1 geographical
  - 4.2.2 economic
  - 4.2.3 social
  - 4.2.4 political
  - 4.2.5 cultural
  - 4.2.6 environmental
- 4.3 contrast risks and challenges to opportunities and indicate on what basis a positive decision would be made to proceed with a foreign venture
- 4.4 describe how management practices differ in the global marketplace in relation to:
  - 4.4.1 leadership practices
  - 4.4.2 organizational structures
  - 4.4.3 employee motivation levels/incentives
  - 4.4.4 quality standards

### **5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE MAM3040: PROMOTION: SALES TECHNIQUES**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students learn and demonstrate techniques for successful selling.

**Parameters:** No specialized equipment or facilities.

**Supporting Courses:** MAM1010: Marketing & Management  
MAM1020: Quality Customer Service

**Outcomes:** The student will:

### **1. critique salespersons and customers during the selling process**

- 1.1 define selling and discuss the role of the salesperson in:
  - 1.1.1 the buying and selling process
  - 1.1.2 selling himself or herself, the products/services and the business
  - 1.1.3 human relations
- 1.2 discuss the effect of ethical and legal considerations on the role of the salesperson
- 1.3 identify personality traits that are needed by salespeople and indicate why they are important
- 1.4 describe how sales support activities link to success in sales; e.g., stockkeeping, housekeeping, building displays, preventing loss/waste, directing customers, handling complaints
- 1.5 list characteristics that customers expect to find in a salesperson and indicate:
  - 1.5.1 why they are important
  - 1.5.2 why they can have either a positive or negative effect
- 1.6 explain what is required in a successful sales presentation
- 1.7 describe motivators for why people buy
- 1.8 describe different customer types
- 1.9 describe what produces satisfaction when making a personal purchase including:
  - 1.9.1 evaluating alternatives
  - 1.9.2 making the purchase
  - 1.9.3 re-evaluating the purchase

### **2. develop and demonstrate proper sales techniques**

- 2.1 describe how a salesperson prepares for the customer including:
  - 2.1.1 customer characteristics/motives
  - 2.1.2 product/service information
- 2.2 research and analyze information related to prospective customers and product information
- 2.3 explain how the welcome statement can help get attention and establish customer rapport
- 2.4 practise and demonstrate using different approaches for a variety of situations including social, service and merchandising
- 2.5 explain the effectiveness and timing used by the salesperson to identify the customer's needs and wants; e.g., observe customer, use selling statement(s), ask question(s), listen to customer
- 2.6 develop a series of questions to determine the customer's needs
- 2.7 describe the importance of determining the type of customer and how the sales presentation is tailored to encourage the customer
- 2.8 explain how the salesperson can recognize customer buying signals
- 2.9 suggest possible sales activities/responses for customer personality types



- 2.10 describe the use of sensory appeal in sales demonstrations and how it is effective
- 2.11 identify other techniques that are used by salespersons to encourage customers
- 2.12 identify and list at least 10 unique selling points (USPs) for a product
- 2.13 turn product features or USPs into customer benefits
- 2.14 explain what a salesperson can do to counteract customer:
  - 2.14.1 excuses
  - 2.14.2 objections
- 2.15 describe possible techniques for answering objections and indicate under what circumstances they could be appropriately used as an answering method
- 2.16 prepare a variety of objections that customers may raise and describe how to overcome these objections effectively
- 2.17 describe how a natural close to the sale can be achieved by including the following alternatives:
  - 2.17.1 stop demonstrating/showing the product
  - 2.17.2 narrow the selection
  - 2.17.3 discuss ownership
  - 2.17.4 ask to buy; e.g., “will this be cash or charge”
  - 2.17.5 determine why there is reluctance
  - 2.17.6 be confident
- 2.18 describe the conditions under which the salesperson determines the appropriate time to close the sale
- 2.19 explain the purpose of the trial close and how it can be included in the sales discussion
- 2.20 identify a variety of closing techniques and describe the circumstances that would best support each
- 2.21 describe lost sales, errors in closing a sale and preparing for the next sale
- 2.22 identify the techniques that can be used to support more sales now and in the future
- 2.23 demonstrate the mechanics of closing including:
  - 2.23.1 ringing in the sale
  - 2.23.2 wrapping/bagging merchandise
  - 2.23.3 taking leave

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

### **4. create a transitional strategy to accommodate personal changes and build personal values**

- 4.1 identify short-term and long-term goals
- 4.2 identify steps to achieve goals

## **COURSE MAM3050: DISTRIBUTING GOODS & SERVICES**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students explore the channels of distribution and modes of transportation used to direct goods from the producer to the consumer.

**Parameters:** No specialized equipment or facilities.

**Supporting Course:** MAM1010: Marketing & Management

**Outcomes:** The student will:

### **1. identify and compare different channels of distribution and modes of transportation**

- 1.1 define channels of distribution and provide examples
- 1.2 research the following three major distribution policies and identify types of products for each policy:
  - 1.2.1 extensive
  - 1.2.2 selective
  - 1.2.3 exclusive
- 1.3 evaluate the role of producers, processors, manufacturers, agents, brokers, wholesalers, retailers and consumers, and identify examples for each
- 1.4 compare the most common types of channels and identify the types of products that go through each channel including:
  - 1.4.1 produce to consumer (direct)
  - 1.4.2 one intermediary (retailer)
  - 1.4.3 two intermediaries (wholesaler, retailer)
  - 1.4.4 three intermediaries (agent, wholesaler, retailer)
- 1.5 research the role of a broker and commission agent for a retailer and manufacturer
- 1.6 identify and list the functions of a wholesaler
- 1.7 research the importance of wholesalers to manufacturers and to retailers
- 1.8 research local wholesalers in their community
- 1.9 describe the different types of agent intermediaries and their role in the distribution process

### **2. identify and describe different types of retailers present in the community**

- 2.1 analyze the common types of retail stores and identify examples of each, including both service and merchandising businesses
- 2.2 describe types of nonstore retailers
- 2.3 analyze future retailing opportunities and how they might affect traditional channels

### **3. identify and present the channels of distribution and modes of transportation used for a manufactured product**

- 3.1 explain the role transportation plays within the channels of distribution
- 3.2 illustrate the modes of transportation used for a variety of different products; e.g., rail, road, pipeline, air, water
- 3.3 compare the advantages and disadvantages of the various modes of transportation with regard to cost, accessibility, reliability, in-transit time, flexibility
- 3.4 research developments in transportation methods

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE MAM3060:     SETTING UP A RETAIL STORE**

**Level:**                     Advanced

**Prerequisite:**           None

**Description:**           Students develop retail store images, examine potential locations and design store layouts. Students should be given hands-on experience by researching a location for an actual retailing opportunity and by designing a layout for this retail store. This course focuses on students owning a retail business and learning the necessary steps for success.

**Parameters:**           No specialized equipment or facilities, but students may require access to a retail facility for reference.

**Supporting Courses:**   MAM1010: Marketing & Management  
                                  MAM2040: Retail Operations  
                                  ENT2030: Marketing the Venture

**Outcomes:**             The student will:

### **1. create an image for a retail business**

- 1.1 identify what creates a favourable image; e.g., store name, targeting one's market, quality/price of product and service, retail policies and services such as credit, return policies and guarantees
- 1.2 identify a possible retail business to design
- 1.3 develop a favourable image for a possible retail business

### **2. analyze and justify a location and site for a retail business**

- 2.1 describe marketing research strategies
- 2.2 identify the community for a possible retail business site; e.g., city, town, district
- 2.3 list store location objectives regarding target market, business environment and competition
- 2.4 identify and investigate a preliminary list of communities
- 2.5 compare communities selected; short list and rank the communities
- 2.6 choose the best community for the retail business
- 2.7 identify and research various sites within the community
- 2.8 research traffic patterns
- 2.9 research options for choosing a location by:
  - 2.9.1 comparing buying versus leasing
  - 2.9.2 calculating how to best maximize sales
  - 2.9.3 evaluating the site, based on store image
  - 2.9.4 analyzing large competition versus one-of-a-kind

### **3. design an effective floor plan, using the principles of store design and layout**

- 3.1 analyze the:
  - 3.1.1 space required
  - 3.1.2 workflow patterns including employees and customers
  - 3.1.3 equipment, display and physical arrangement
- 3.2 describe and illustrate how to incorporate:
  - 3.2.1 enticements to customers; e.g., come, stay, buy, return
  - 3.2.2 efficiency and service
  - 3.2.3 flexibility and convenience



- 3.2.4 safety for employees and customers
- 3.2.5 security for merchandise and equipment
- 3.2.6 maintenance; e.g., day-to-day, repair, remodel
- 3.3 research the principles of store front and interior floor design and layout; e.g., features, impulse goods vs. staple goods, physical arrangement
- 3.4 compare exterior and interior layouts among stores with similar product lines including:
  - 3.4.1 supermarkets
  - 3.4.2 department stores
  - 3.4.3 small retail stores
  - 3.4.4 service operations
- 3.5 identify elements that compete for space on the floor
- 3.6 describe and illustrate aspects of the design including:
  - 3.6.1 why the plan is functional
  - 3.6.2 selling and nonselling areas
  - 3.6.3 equipment and furniture
  - 3.6.4 decor
  - 3.6.5 image of business both inside and outside
- 4. identify, research and select vendors for the purchase of fixtures and equipment**
- 5. prepare a maintenance schedule for a retail business**
  - 5.1 prepare housekeeping schedules and work plans including:
    - 5.1.1 daily cleaning
    - 5.1.2 general maintenance
    - 5.1.3 redecorating for promotional and upkeep purposes
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals



## **COURSE MAM3070: OFFICE SYSTEMS 2**

**Level:** Advanced

**Prerequisite:** MAM2050: Office Systems 1

**Description:** Students evaluate and demonstrate effective office environment strategies and processes, use electronic office equipment, and manage processes related to electronic communications and business meetings.

**Parameters:** Access to electronic office equipment.

**Outcomes:** The student will:

**1. evaluate and make recommendations for improving the quality of the office environment**

- 1.1 research the change process within an office as electronic technologies alter the office environment
- 1.2 analyze the changing role of the office worker at different levels; e.g., entry-level, supervisory, top-level management
- 1.3 research various job descriptions; e.g., responsibilities (direct, indirect), setting priorities, reporting structure, opportunities for initiative
- 1.4 illustrate the flow of work for one or more office functions
- 1.5 compare office manuals for common policies and procedures
- 1.6 propose strategies by which an office could improve the commitment to quality management
- 1.7 implement strategies that increase personal productivity including:
  - 1.7.1 time and work management
  - 1.7.2 setting priorities
  - 1.7.3 resource management

**2. demonstrate independent use of office strategies and procedures and of electronic office equipment including procedures for electronic communications**

- 2.1 apply efficient communication procedures and protocols when using a variety of electronic office equipment
- 2.2 describe the various communication systems available to a business; e.g., telephone, voice messaging systems, electronic mail, facsimiles, the Internet, teleconferencing
- 2.3 research a variety of communication procedures and protocols that are practised for each system; e.g., answering phones promptly, delivering fax messages promptly, answering electronic mail messages immediately
- 2.4 identify strategies to develop skills and train others on a variety of electronic office equipment
- 2.5 follow ethics and laws regarding the use of electronic office equipment
- 2.6 demonstrate proper personal grooming and dress appropriate to the office environment

**3. demonstrate ability to plan and run a business meeting**

- 3.1 identify procedures when planning a meeting, including in formal and informal settings
- 3.2 describe strategies to prepare for the meeting
- 3.3 describe how meetings run effectively and efficiently
- 3.4 describe the procedures to follow after the meeting
- 3.5 plan and simulate a business meeting

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE MAM3080: COMMUNICATION STRATEGIES 3**

**Level:** Advanced

**Prerequisite:** MAM1030: Communication Strategies 1

**Description:** Students expand and continue to improve oral and written communication strategies necessary for efficient and effective management of information. Focus is on technical writing strategies and composing at a computer work station when preparing formal business reports and proposals.

**Parameters:** Access to an appropriate computer work station, word processing software and support materials.

**Supporting Course:** MAM2060: Communication Strategies 2

**Outcomes:** The student will:

### **1. critique formal technical reports**

- 1.1 identify examples of technical writing; e.g., instruction manuals, research reports
- 1.2 describe the following characteristics of effective technical writing:
  - 1.2.1 directed to a topic or need
  - 1.2.2 accurate terminology, procedures and data
  - 1.2.3 current, clear, concise and complete
- 1.3 research the parts of a formal technical report including:
  - 1.3.1 cover
  - 1.3.2 title page
  - 1.3.3 table of contents
  - 1.3.4 list of illustrations
  - 1.3.5 synopsis and/or executive summary
  - 1.3.6 body of the text; e.g., discussion, conclusions, recommendations, footnotes
  - 1.3.7 appendix
  - 1.3.8 bibliography or reference list
  - 1.3.9 letter of transmittal
- 1.4 identify and demonstrate competencies needed for effective technical writing including:
  - 1.4.1 concentration
  - 1.4.2 precision
  - 1.4.3 summarization skills
- 1.5 examine and evaluate a variety of technical reports
- 1.6 compare technical writing with other writing; e.g., creative, historiographical, journalistic

### **2. prepare a formal technical report that is clear, concise and meets the needs of the report user**

- 2.1 research and use the following prewriting strategies when preparing formal technical reports:
  - 2.1.1 determine the purpose
  - 2.1.2 prepare an outline
  - 2.1.3 conduct the research
  - 2.1.4 develop a note-taking system
  - 2.1.5 prepare an outline; put all sections together

- 2.2 compose the first draft of the formal document using word processing skills, templates and effective strategies for formal reports including:
  - 2.2.1 write one section at a time; the executive summary should be written last
  - 2.2.2 use headings and side headings for ease of reading
- 2.3 analyze the document using revising strategies to:
  - 2.3.1 check the draft against the outline
  - 2.3.2 ensure the purpose has been achieved
  - 2.3.3 check that report is clear, concise and complete
  - 2.3.4 check the facts for accuracy
- 2.4 use proofreading strategies to:
  - 2.4.1 proofread for facts, dates, names, figures and statistical information
  - 2.4.2 proofread for sentence structure, grammar, spelling, punctuation and format
- 3. deliver an oral, formal technical report supported by visual aids**
  - 3.1 research and critique presentation strategies
  - 3.2 identify types of visual aids to use in a presentation
  - 3.3 rehearse making an oral presentation of a formal technical report using visual aids and effective presentation strategies and tools
  - 3.4 present the oral technical report
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE MAM3090: RECORDS MANAGEMENT 2**

**Level:** Advanced

**Prerequisite:** MAM2080: Records Management 1

**Description:** Students describe the advantages of an automated records system. Numeric, subject and geographic coding are emphasized.

**Parameters:** Access to a computer work station and database software.

**Supporting Courses:** INF1050: Database 1  
INF2070: Database 2

**Outcomes:** The student will:

### **1. identify and describe basic electronic records management concepts**

- 1.1 describe and give examples of automated records systems
- 1.2 describe the advantages of automated records systems over manual systems
- 1.3 research safety and security procedures of automated records
- 1.4 describe the process known as micrographics
- 1.5 research the types of microfilm and their uses; e.g., roll film, microfiche, microfilm jacket, aperture cards
- 1.6 identify and describe electronic equipment and supplies necessary to create and maintain an efficient electronic records management system

### **2. demonstrate ability to plan, create and use an electronic records management system in the numeric, subject and geographic categories**

- 2.1 identify records that are or should be managed by number
- 2.2 explain the advantages and disadvantages of numeric storage
- 2.3 describe numeric storage methods including:
  - 2.3.1 consecutive numbering methods
  - 2.3.2 nonconsecutive numbering or terminal digit methods
- 2.4 explain the differences between consecutive and nonconsecutive numeric record storage
- 2.5 describe how records can be stored chronologically
- 2.6 create a numeric records management system
- 2.7 practise using the rules for numeric filing by indexing, coding and storing a variety of records
- 2.8 identify records that are or should be managed by subject
- 2.9 explain the advantages and disadvantages of subject storage
- 2.10 describe the standard arrangements for subject storage including:
  - 2.10.1 straight dictionary arrangement
  - 2.10.2 encyclopedic arrangement
- 2.11 create a subject records management system
- 2.12 practise using the rules for subject filing by indexing, coding and storing a variety of records
- 2.13 identify records that are or should be managed by geographic location
- 2.14 explain the advantages and disadvantages of geographic storage
- 2.15 explain the differences and similarities between geographic and alphabetic methods
- 2.16 create a geographic records management system
- 2.17 practise using the rules for geographic filing by indexing, coding and storing a variety of records



- 2.18 demonstrate the following tasks for each records management system (subject, numeric, and geographic) created:
  - 2.18.1 store new data or records
  - 2.18.2 retrieve data or records
  - 2.18.3 sort and/or query records
  - 2.18.4 create a report
  - 2.18.5 manipulate and edit records
  - 2.18.6 analyze strategies to prevent records from being mismanaged
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE MAM3100: PROMOTION: BROADCAST ADVERTISING**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students are introduced to broadcast communication channels, delivery strategies and advertising media that can be used to inform potential customers about products and services available in the marketplace.

**Parameters:** Access to a voice recorder and an image capture device for broadcast advertising.

**Supporting Course:** MAM1010: Marketing & Management

**Outcomes:** The student will:

- 1. investigate and report on basic broadcast media types and concepts**
  - 1.1 describe the types of broadcast advertising
  - 1.2 describe the role of the Canadian Radio-television and Telecommunications Commission (CRTC)
  - 1.3 describe the history of both radio and television
  - 1.4 explain the types of ownership and programming found in radio and television
  - 1.5 identify a variety of radio stations available to various listeners in the immediate area
  - 1.6 describe the types of television stations that are:
    - 1.6.1 network-affiliated
    - 1.6.2 network-owned
    - 1.6.3 independent
  - 1.7 describe other means of television advertising including cablevision, pay TV, videocassette recordings, satellite, infomercials
- 2. evaluate advertisements for radio, television and Web-based mediums**
  - 2.1 analyze the number of views per:
    - 2.1.1 hit
    - 2.1.2 time slot
  - 2.2 analyze the effectiveness of advertisements
- 3. design and create an effective promotional advertisement for broadcast; e.g. television, radio**
  - 3.1 identify and calculate the costs of commercials in various time slots
  - 3.2 identify elements involved in the preparation of a promotional spot
  - 3.3 demonstrate the use of required production techniques when planning and producing promotional spots
  - 3.4 present and evaluate promotional spots
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE MAM3120: E-COMMERCE 3**

**Level:** Advanced

**Prerequisite:** MAM2110: E-commerce 2

**Description:** Students will investigate and expand strategies to gather customer information and design e-commerce Web sites that take advantage of technological advances.

**Note:** The e-commerce Web site that is designed may or may not be made operational.

**Parameters:** Access to an appropriate computer work station, software, the Internet and support materials.

**Supporting Courses:** ENT2030: Marketing the Venture  
Multimedia and Web Authoring course  
Electronic Publishing course  
Web design course

**Outcomes:** The student will:

### **1. research the challenges of obtaining customer information**

- 1.1 identify methods of obtaining (data mining) customer information, including geographic, demographic, psychographic and behavioural information
- 1.2 outline possible uses of customer data; e.g., greeting customers by name, modifying the information presented to customers, providing recommended buying lists and information on sales and discounts, providing personal shopping representatives to assist customers
- 1.3 identify various databases that can be obtained to support:
  - 1.3.1 customer information
  - 1.3.2 order tracking
  - 1.3.3 e-mail addresses
  - 1.3.4 product-related or technical-related information
- 1.4 list data fields and field properties to include in a registration form; e.g., geographic, demographic, psychographic
- 1.5 describe how cookies work to identify customers and their habits and outline information that can or cannot be retrieved

### **2. research financial considerations when developing and maintaining an e-commerce Web site**

- 2.1 compare different ways of hosting e-commerce Web sites in terms of degree of control of operations and improvements, developmental and transactional costs and processing speed
- 2.2 list potential income-generating opportunities including:
  - 2.2.1 sales of goods and services
  - 2.2.2 partnerships
  - 2.2.3 auctions; e.g., general consumer, specialty consumer
- 2.3 identify technological advances in e-commerce Web site development including:
  - 2.3.1 connection options with customer, network, e-commerce Web site and browser
  - 2.3.2 software
  - 2.3.3 hardware



- 2.3.4 wireless mobile devices
- 2.3.5 security and privacy systems

### **3. analyze content-related features of effective e-commerce Web sites**

#### **3.1 examine if:**

- 3.1.1 the home page shows the main components of the Web site effectively
- 3.1.2 the search function allows efficient access to information
- 3.1.3 company information is included; e.g., name of company, address, telephone number, fax number, e-mail contact, list of key personnel, video of key staff
- 3.1.4 company policies on privacy, security and terms of business are clearly stated
- 3.1.5 products/services are effectively displayed; e.g., name, code, description, price, option to buy, link to shopping cart, detailed product information
- 3.1.6 the shopping cart indicates purchase name, code, price(s), discount, shipping costs, taxes and total costs
- 3.1.7 the shopping cart provides options to delete the purchase(s), continue shopping or check out with a link to shipping choices
- 3.1.8 the shipping choices (courier, postal service, bus, rail, air, truck) and costs are clear and there is a link to payment choices
- 3.1.9 the payment choices are clear; e.g., credit card, debit card, electronic cash
- 3.1.10 forms to gather customer information are well-designed
- 3.1.11 incentives to register are clear and attract attention
- 3.1.12 drop-down menus assist in filling out forms
- 3.1.13 additional content is offered to attract customers; e.g., detailed product/service information, frequently asked questions, "What's New," newsroom, forum, Web site tour, thank-you page, games
- 3.1.14 text is appropriate for potential customers
- 3.1.15 text is accurate; e.g., no errors in spelling, punctuation, grammar

### **4. analyze design- and technical-related features of effective e-commerce Web sites**

#### **4.1 examine if:**

- 4.1.1 the overall impact of the Web site is positive and motivating
- 4.1.2 the Web site aligns with potential customers' interests and needs
- 4.1.3 the pages are consistent in format, text size, font, headings and colour
- 4.1.4 colour contrast helps items stand out or blend in
- 4.1.5 the background is effective
- 4.1.6 special effects have been added and are appropriate; e.g., pictures, photographs, graphics, sound, borders, audio, animation, video, marquee, 3-D graphics, 3-D animation
- 4.1.7 the home page provides clear links to other pages of the Web site
- 4.1.8 navigation methods are effective; e.g., menus, bars, links such as text, icon, banner ad, hover button and image map
- 4.1.9 navigation throughout the Web site is efficient; e.g., three or fewer "clicks"
- 4.1.10 after the home page, navigation links are positioned in a standard location
- 4.1.11 the organization of information is efficient; e.g., least used at "back" of Web site
- 4.1.12 the processing speed is acceptable throughout the Web site
- 4.1.13 the domain name (URL) is indicative of the products/services offered
- 4.1.14 viewers have the option to register and the ability to ask questions, request information and give feedback
- 4.1.15 viewers have the option to control viewing choices; e.g., text only, view videos, turn off sound, enlarge/reduce picture size, customize the home page, select language



**5. design an e-commerce Web site that obtains customer information**

- 5.1 design a registration form to obtain customer information that contains text entry boxes and form validation; e.g., field masks that limit type of entry or space for text when applicable; hidden fields displayed with an asterisk (\*); check boxes to indicate one or more chosen options; pop-up menus and scrolling menus to provide choices; plain push buttons or more creative buttons such as SUBMIT to send form data to the server and RESET to clear all form fields
- 5.2 list possible incentives to motivate the customer to register; e.g., free items, discounts, rewards, contests
- 5.3 complete the process of building an e-commerce Web site by:
  - 5.3.1 planning the Web site
  - 5.3.2 developing the Web site including: content-related features, design- and technical-related features
  - 5.3.3 testing and presenting the Web site
  - 5.3.4 modifying, publishing and documenting the Web site

**6. apply consistent and appropriate work station routines**

- 6.1 demonstrate good health and safety; e.g., posture, positioning of hardware and furniture
- 6.2 employ practices that security for hardware, software, supplies and personal work
- 6.3 apply effective decision-making strategies when using the Internet
- 6.4 use related terminology to describe basic protocols, processes and tools

**7. demonstrate basic competencies**

- 7.1 demonstrate fundamental skills to:
  - 7.1.1 communicate
  - 7.1.2 manage information
  - 7.1.3 use numbers
  - 7.1.4 think and solve problems
- 7.2 demonstrate personal management skills to:
  - 7.2.1 demonstrate positive attitudes and behaviours
  - 7.2.2 be responsible
  - 7.2.3 be adaptable
  - 7.2.4 learn continuously
  - 7.2.5 work safely
- 7.3 demonstrate teamwork skills to:
  - 7.3.1 work with others
  - 7.3.2 participate in projects and tasks

**8. create a transitional strategy to accommodate personal changes and build personal values**

- 8.1 identify short-term and long-term goals
- 8.2 identify steps to achieve goals



**COURSE MAM3130: AGRICULTURE MARKETING**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students apply knowledge of marketing principles focusing on materials and services offered to the consumer through open and closed marketing structures and techniques that influence the supply of a commodity, product or service.

**Parameter:** None

**Supporting Course:** MAM1010: Marketing & Management

**Outcomes:** The student will:

**1. investigate factors that influence open agriculture marketing**

- 1.1 illustrate the laws of supply and demand, and factors that cause changes in supply, demand and pricing of the commodity, product or service including:
  - 1.1.1 imports and exports
  - 1.1.2 environmental factors
  - 1.1.3 consumer choices
  - 1.1.4 economic conditions
  - 1.1.5 technology
- 1.2 examine competition in both domestic and international markets, and barriers/restrictions on free trade including:
  - 1.2.1 cultural, ethical, political and legal
  - 1.2.2 economic systems
  - 1.2.3 international organizations
  - 1.2.4 trade agreements
- 1.3 identify marketing structures used to facilitate commodity exchange; e.g., Winnipeg Commodity Exchange, Omaha Market Exchange, Chicago Grain Exchange
- 1.4 describe the stages through which the agriculture/horticulture product moves en route to the consumer including:
  - 1.4.1 inputs assembly
  - 1.4.2 processing
  - 1.4.3 brokering of product
  - 1.4.4 transport
- 1.5 describe factors that influence consumer preferences and the development of new products and markets within the industry including:
  - 1.5.1 ethical, cultural and religious
  - 1.5.2 demographic
  - 1.5.3 environmental
  - 1.5.4 economic
- 1.6 outline market conditions leading to, and steps in, altering the product or service or developing a related product or service

- 2. describe general characteristics and applications of marketing within a closed, supply managed marketing structure**
  - 2.1 describe past and present trends in the regulated marketing of an agricultural commodity, product or service
  - 2.2 describe factors that have affected marketing practices within the industry including:
    - 2.2.1 consumer trends
    - 2.2.2 trade liberalization
    - 2.2.3 globalization of markets
    - 2.2.4 environmental concerns
    - 2.2.5 subsidy policies
  - 2.3 compare approaches used to market the commodity, product or service in Canada with approaches used in other nations; e.g., United States, Pacific Rim, Europe
  - 2.4 explain the role and impact of regulatory systems and strategies used in marketing the commodity, product or service including:
    - 2.4.1 marketing boards and cooperatives
    - 2.4.2 quota systems and monopolies
  - 2.5 describe the impact of government policies and legislation on marketing activities within the industry including:
    - 2.5.1 provincial, federal and international trade agreements
    - 2.5.2 transportation policies
    - 2.5.3 nontrade standards; e.g., health and safety
  - 2.6 explain the function of income stabilization programs and their effect on long- and short-term market trends
- 3. assess the benefits and costs of open, free enterprise and closed, supply managed marketing systems**
  - 3.1 explain the concept of supply management and differences between non-regulated (open) and regulated (closed) marketing systems
  - 3.2 identify economic factors that affect marketing activities within the industry including:
    - 3.2.1 law of supply and demand
    - 3.2.2 price determination and the futures market
    - 3.2.3 comparative advantage
- 4. explain factors that affect decisions to produce and market an agriculture commodity within an open or closed, supply managed marketing structure**
  - 4.1 identify factors that influence decisions to market the commodity, product or service including:
    - 4.1.1 commodity supply, quality and pricing
    - 4.1.2 financial constraints, including capital, credit and cash flow
    - 4.1.3 time constraints on perishable products
    - 4.1.4 transportation requirements
  - 4.2 identify ways in which relevant trade policies and regulations may influence marketing decisions including:
    - 4.2.1 international and domestic trade rules
    - 4.2.2 transportation policies
    - 4.2.3 income support programs and subsidies
  - 4.3 identify and assess viable alternatives for marketing the commodity, product or service; e.g., marketing board, cooperative, direct sale

- 5. develop and present a plan for marketing an agriculture/horticulture commodity, product or service through a particular marketing structure**
  - 5.1 explain the goals of marketing an agriculture/horticulture commodity, product or service including:
    - 5.1.1 market position and profit margin
    - 5.1.2 image creation and industry strength
    - 5.1.3 price discovery
    - 5.1.4 product exposure
  - 5.2 compare potential strategies that might be used to distribute the product or service in the marketplace including:
    - 5.2.1 extensive; e.g., open
    - 5.2.2 selective; e.g., niche
    - 5.2.3 exclusive; e.g., franchise
    - 5.2.4 processing
    - 5.2.5 brokering of product
    - 5.2.6 transport
  - 5.3 describe one or more strategies that may be used to promote an agriculture/horticulture commodity, product or service; e.g., advertising, personal sales, telemarketing, display, in-store samples, trade shows
  - 5.4 use market research and product development in adapting the commodity, product or service to meet present and future market needs; e.g., consumer polls, surveys, focus groups
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals





## **COURSE MAM3140: ENERGY & RESOURCES MARKET BASICS & TRENDS**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students explain the basic principles involved in marketing an energy or mineral resource and analyze trends in the development and marketing of energy or mineral products.

**Parameters:** Access to an energy or mineral industry.

**Supporting Course:** MAM2130: Energy & Resources Supply & Distribution

**Outcomes:** The student will:

- 1. identify basic marketing principles and their application in an energy or mineral industry**
  - 1.1 research local, national and international markets for an energy or mineral resource
  - 1.2 analyze market demands and fluctuations
  - 1.3 distinguish between nonregulated (open) and regulated (closed) marketing systems
  - 1.4 identify and compare viable marketing alternatives for the product or service including:
    - 1.4.1 direct producer marketing
    - 1.4.2 open markets
    - 1.4.3 marketing boards
    - 1.4.4 cooperatives
  - 1.5 identify factors that influence the pricing of the product or service including:
    - 1.5.1 market analysis
    - 1.5.2 supply and demand
    - 1.5.3 cost factors
  - 1.6 explain how products are moved to market, including the function of intermediate stops such as terminals and bulk plants
  - 1.7 describe the effectiveness of different methods of transportation; e.g., water systems, road and rail systems, pipeline systems
  - 1.8 evaluate the role of advertising and promotion in retailing practices and their impact on consumer demands
- 2. describe market demands for an energy or mineral product and describe the impact of government policies on marketing practices**
  - 2.1 identify social, political, economic and environmental factors that affect market demand for an energy or mineral resource
  - 2.2 research and prepare a case history on market demands for one energy or mineral commodity
  - 2.3 identify major export partners for oil, oil products and natural gas, coal and coal-generated energy, or mineral resources
  - 2.4 compare the nature and extent of Canada's market share in North America, the Pacific Rim, Europe and other locations
  - 2.5 identify national and provincial government policies that influence the development and marketing of an energy or mineral resource
  - 2.6 research and prepare a case history regarding the impact of one government policy on the development and marketing of an energy or mineral resource in Canada

- 2.7 evaluate the impact of national and provincial environmental protection policies on the development and marketing of a commodity or product
- 2.8 evaluate the impact of national and provincial transportation policies on the development and marketing of a commodity or product
- 2.9 evaluate the impact of provincial, national and international trade agreements on the development and marketing of an energy or mineral resource
- 3. identify market trends and development opportunities in domestic and international markets**
  - 3.1 consider factors that influence market trends and resulting trade opportunities
  - 3.2 evaluate the impact of developing technologies on one of Canada's energy or mineral products
  - 3.3 identify market opportunities that arise from product diversification and specialization, international trade and participation in a global economy
  - 3.4 outline market conditions leading to, and steps in altering, a product or service or developing a related product or service
  - 3.5 explain the role of market research and product development in adapting a commodity, product or service to meet present and anticipated needs
  - 3.6 evaluate opportunities for the global marketing of a commodity, product or service
  - 3.7 compare approaches used to market a commodity, product or service in Canada with approaches used in other nations
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE MAM3150: THE FOREST MARKETPLACE**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students describe the range of consumer products and services derived from Canada's forests and research the production and marketing of these forest products.

**Parameters:** Access to resources available from forest products and forest service industries.

**Outcomes:** The student will:

- 1. describe fibre and nonfibre products and services derived from Canada's forests**
  - 1.1 identify market-based products and services derived from Alberta's forests including:
    - 1.1.1 primary wood products
    - 1.1.2 wood-fabricated materials
    - 1.1.3 wood pulp and paper products
    - 1.1.4 chemical products
    - 1.1.5 trapping, fishing and hunting
    - 1.1.6 guiding and outfitting
    - 1.1.7 tourism and recreational pursuits
  - 1.2 identify psychological benefits and extra-market values derived from Alberta's forests including:
    - 1.2.1 ecological values
    - 1.2.2 aesthetic and spiritual values
    - 1.2.3 bequest value for future generations
  - 1.3 describe trends in the consumptive and nonconsumptive use of forests in Canada and Alberta including:
    - 1.3.1 recreation
    - 1.3.2 trapping
    - 1.3.3 logging
    - 1.3.4 oil and gas development
- 2. explain processes used in developing fibre and nonfibre forest products and services in Canada and Alberta**
  - 2.1 identify and sequence the steps that are involved in producing a fibre commodity including:
    - 2.1.1 harvest and transportation
    - 2.1.2 processing techniques
    - 2.1.3 grading, packing and storage
  - 2.2 identify materials and services that are required at each stage in the production of a fibre commodity including:
    - 2.2.1 human and natural resources
    - 2.2.2 energy and technologies
    - 2.2.3 inspection and regulation
  - 2.3 describe recent developments in milling and pulping technology and their impact on the forest industry; e.g., fibre utilization, environmental stewardship
  - 2.4 identify new and emerging products and services derived from Alberta's forests; e.g., cattle food, methane gas

- 3. identify market trends and develop a marketing plan for a forest product or service**
  - 3.1 describe the nature and extent of Canada's market share in North America, the Pacific Rim, Europe and other locations
  - 3.2 describe systems used to market Canada's forest products and services at local, national and international levels
  - 3.3 identify social, economic and environmental factors that influence consumer trends and market demands for forest products and services
  - 3.4 describe the impact of developing technologies on Canada's fibre and nonfibre forest products including:
    - 3.4.1 efficiency of production processes
    - 3.4.2 improved utilization
    - 3.4.3 focus on value-added and knowledge intensive commodities
  - 3.5 identify market opportunities that arise from product diversification and specialization, international trade and participation in a global economy
  - 3.6 create a plan for identifying new market opportunities, developing a forest product and managing the venture
- 4. explain the types of forest certification and what their objectives are; e.g., International Organization for Standards (ISO) 14001, Canadian Standards Association (CSA), Forest Stewardship Council, Sustainable Forestry Initiative**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



**COURSE MAM3910: MAM PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

**COURSE MAM3920: MAM PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

## **COURSE NET1010: DIGITAL TECHNOLOGY 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students construct and demonstrate logic systems and their unique functions.

**Parameters:** Access to a five-volt power supply, a logic probe and related materials.

**Outcomes:** The student will:

- 1. describe the binary numbering system and logic gates and construct and verify basic logic gates**
  - 1.1 research and describe the binary numbering system
  - 1.2 develop the circuits and tables for the following logic gates:
    - 1.2.1 AND
    - 1.2.2 OR
    - 1.2.3 NOT
    - 1.2.4 XOR
    - 1.2.5 NAND
    - 1.2.6 NOR
    - 1.2.7 XNOR
- 2. construct a simple logic circuit and explain its functions**
  - 2.1 construct digital probes
  - 2.2 test digital probes
  - 2.3 breadboard a digital system, such as a combination lock and a keyboard
  - 2.4 use emulation software; e.g., electronics workbench
- 3. identify the major integrated circuit (IC) families and describe their unique functions**
  - 3.1 distinguish between analog and digital systems
  - 3.2 identify major component sections of a logic system including:
    - 3.2.1 random-access memory (RAM)
    - 3.2.2 read-only memory (ROM)
    - 3.2.3 central processing unit (CPU)
    - 3.2.4 registers
    - 3.2.5 input/output (I/O) ports
  - 3.3 identify the application, pinouts and use of various IC chips from manufacturing codes
  - 3.4 identify characteristics of various IC chips from different manufacturers which do similar functions using ECG, NTE and other replacement guides
  - 3.5 identify the pinouts and function of any IC using the IC master reference texts
  - 3.6 identify the difference between various logic families
  - 3.7 identify and explain differences between various logic systems
  - 3.8 solve a digital problem and build a digital system for a solution; e.g., two or three inputs for a single output
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 identify and follow laboratory safety procedures
  - 4.2 explain how to avoid electrostatic discharges around IC chips
  - 4.3 demonstrate an understanding of grounding, voltage and current rating of various IC families
  - 4.4 use a digital probe



**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. make personal connections to the cluster content and processes to inform possible pathway choices**

- 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 6.2 create a connection between a personal inventory and occupational choices

## **COURSE NET1910: NET PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

#### **1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

#### **2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

#### **3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE NET2010: DIGITAL TECHNOLOGY 2**

**Level:** Intermediate

**Prerequisite:** NET1010: Digital Technology 1

**Description:** Students demonstrate knowledge of digital principles, by using small-scale transistor–transistor logic (TTL) and complementary metal-oxide semiconductor (CMOS) integrated technology.

**Parameters:** Access to a digital logic trainer, an oscilloscope, function generation and resource materials.

**Supporting Course:** ELT2010: Electro-assembly 2

**Outcomes:** The student will:

**1. identify and interface components with TTL and CMOS small-scale integrated circuit (IC) families**

- 1.1 explain the difference between various gate applications, counters and registers
- 1.2 distinguish the difference among various numbering systems and binary codes including:
  - 1.2.1 binary
  - 1.2.2 octal
  - 1.2.3 hexadecimal
  - 1.2.4 binary coded decimal (BCD)
  - 1.2.5 American standard code for information interchange (ASCII)

**2. identify components and construct a prototype of typical small-scale and complex logic networks using TTL and CMOS families of ICs**

- 2.1 use emulation software on a design problem
- 2.2 demonstrate the use of boolean algebra to analyze a logic circuit
- 2.3 demonstrate how to prototype and troubleshoot the following fundamental logic gates in typical and complex logic networks:
  - 2.3.1 AND
  - 2.3.2 NAND
  - 2.3.3 NOR
  - 2.3.4 XNOR
  - 2.3.5 OR, Registers
  - 2.3.6 F/F counters
  - 2.3.7 simple comparators
- 2.4 use a printed circuit (PC) board to fabricate a digital circuitry project; e.g., digital dice, sound generator decision maker, electronic scoreboard, IC tester
- 2.5 use PC board software to lay out a digital circuit
- 2.6 solve, construct and experiment with real-world problems using combination and sequential logic design for applications; e.g., traffic lights, aircraft landing gear, motor controls
- 2.7 prototype the solution for a logic problem using a breadboard and develop a truth table

**3. demonstrate established laboratory procedures and safe work practices**

- 3.1 explain and demonstrate how to avoid electrostatic discharges around IC chips, using static mats and grounding straps
- 3.2 demonstrate an understanding of grounding, voltage and current rating of various IC families

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE NET2020: WORKSTATION TECHNOLOGY & OPERATIONS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students learn computer work station operations, including computer architecture, peripherals, configurations, operating system environments and platforms, utility software, diagnostic and protection software, hard drive file updating and maintenance, support resource application and troubleshooting activities.

**Parameters:** Access to an appropriate computer work station, a storage medium, utility software, the Internet and support materials.

**Outcomes:** The student will:

### **1. disassemble/assemble a working computer and perform basic troubleshooting procedures**

- 1.1 assemble a computer from given computer parts including:
  - 1.1.1 set the system configuration switches
  - 1.1.2 install computer operating system
  - 1.1.3 install monitor/keyboard
  - 1.1.4 test computer
- 1.2 demonstrate basic computer troubleshooting techniques by:
  - 1.2.1 using a system board flowchart to locate a system board fault
  - 1.2.2 listing symptoms of hard drive failure
- 1.3 explain the use of debug, error check and format/reformat of a hard drive

### **2. identify and explain computer system components**

- 2.1 research the history of computers, processors and various operating systems
- 2.2 describe the environmental, social, economic and political contribution that computers have made to our social fabric
- 2.3 define basic computer terms
- 2.4 identify and describe parts of a computer
- 2.5 explain the different sizes and types of expansion boards
- 2.6 identify and compare ports
- 2.7 identify adapter cards
- 2.8 explain memory expansion methods
- 2.9 explain the operation of various hard drive types; e.g., platter, solid state
- 2.10 name the types of displays
- 2.11 define and describe various purposes of software; e.g., system, application

### **3. identify the fundamentals of using operating systems**

- 3.1 identify differences between operating systems, e.g., Mac, Windows, Linux, and describe operating system revision levels including graphical user interface (GUI), system requirements, application and hardware compatibility
- 3.2 identify names, purposes and characteristics of the primary operating system components including registry, virtual memory and file system
- 3.3 describe features of operating system interfaces

- 3.4 identify the names, locations, purposes and characteristics of operating system files
- 3.5 identify concepts and procedures for creating, viewing and managing disks, directories and files in operating systems
- 4. install, configure, optimize and upgrade operating systems**
  - 4.1 determine what permission level is required for performing the task
  - 4.2 analyze system requirements for upgrading operating systems
  - 4.3 install and/or add a device driver for appropriate peripheral (signed or unsigned) including:
    - 4.3.1 verify installation of the driver; e.g., device manager, functionality
  - 4.4 identify procedures and utilities used to optimize operating systems; e.g., virtual memory, hard drives, temporary files, service, startup, applications
- 5. identify tools, diagnostic procedures and troubleshooting techniques for operating systems**
  - 5.1 identify basic boot sequences, methods and utilities for recovering operating systems
  - 5.2 identify and apply diagnostic procedures and troubleshooting techniques including:
    - 5.2.1 identify the problem
    - 5.2.2 analyze the problem; e.g., potential causes and initial determination of software and/or hardware problem
    - 5.2.3 test related components including connections, hardware/software configurations, device manager, and consult vendor documentation
    - 5.2.4 evaluate results and take additional steps, if needed; e.g., consultation, alternate resources, manuals
    - 5.2.5 document activities and outcomes
  - 5.3 recognize and resolve common operational issues; e.g., bluescreen (PC), force quit (Mac), system lockup
  - 5.4 recognize common error messages, codes and their function
  - 5.5 identify the names, locations, purposes and characteristics of operating system utilities
- 6. perform preventive maintenance on operating systems using common utilities; e.g., software updates, service packs, scheduled backups, restore and restore points**
- 7. apply consistent and appropriate work station routines**
  - 7.1 describe grounding methods when working on computers and use personal grounding systems; e.g., ankle and wrist straps
  - 7.2 describe the aspects and importance of safety and environmental issues
  - 7.3 identify potential safety hazards and take preventive action
  - 7.4 use material safety data sheets (MSDS) or equivalent documentation and appropriate equipment documentation
  - 7.5 use appropriate repair tools
  - 7.6 describe methods to handle environmental and human accidents including incident reporting; e.g. electrical, chemical, physical
  - 7.7 identify potential hazards and implement proper safety procedures including electrostatic sensitive device (ESD) precautions and procedures, a safe work environment and equipment handling
  - 7.8 identify proper disposal procedures for batteries, display devices and chemical solvents and containers
- 8. demonstrate basic competencies**
  - 8.1 demonstrate fundamental skills to:
    - 8.1.1 communicate
    - 8.1.2 manage information
    - 8.1.3 use numbers
    - 8.1.4 think and solve problems

- 8.2 demonstrate personal management skills to:
  - 8.2.1 demonstrate positive attitudes and behaviours
  - 8.2.2 be responsible
  - 8.2.3 be adaptable
  - 8.2.4 learn continuously
  - 8.2.5 work safely
- 8.3 demonstrate teamwork skills to:
  - 8.3.1 work with others
  - 8.3.2 participate in projects and tasks
- 9. identify possible life roles related to the skills and content of this cluster**
  - 9.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 9.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE NET2030: NETWORK STRUCTURES**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students acquire an understanding of network infrastructure and assess the advantages and disadvantages of different types of networks. They also develop knowledge of data transmission principles in a computer network and compare features of different network topologies and transmission methods.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in the computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is given to network infrastructure, concepts and terminology relevant to network topology and architecture. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Supporting Courses:** ELT1010: Electro-assembly 1  
NET1010: Digital Technology 1  
NET2020: Workstation Technology & Operations  
NET2110: Telecommunications 1

**Outcomes:** The student will:

- 1. describe and explain the evolution of computer/Internet networks and the general structure and function of peer-to-peer and server-based networks, local area networks and wide area networks**
  - 1.1 summarize the history of networking, from the telegraph to modern computer technology
  - 1.2 describe the evolution of standards for data transmission, from Morse code to the American standard code for information interchange (ASCII)
  - 1.3 create a time line of specific milestones in the history of computer networking
  - 1.4 identify emerging networking technologies and their impact on global communications
  - 1.5 describe a computer network and solutions provided by computer networking including:
    - 1.5.1 file sharing
    - 1.5.2 hardware sharing
    - 1.5.3 program sharing



- 1.5.4 user communication
- 1.5.5 new methodologies
- 1.6 give examples of resources commonly shared within a network environment
- 1.7 describe the structure, purpose and function of peer-to-peer and server-based networks
- 1.8 compare and contrast peer-to-peer and server-based networks with respect to:
  - 1.8.1 number of work stations
  - 1.8.2 relative cost
  - 1.8.3 security
  - 1.8.4 administration
  - 1.8.5 data backup
- 1.9 describe and compare the structure, purpose and function of local area networks (LANs), metropolitan area networks (MANs) and wide area networks (WANs)
- 1.10 create schematic diagrams for the physical layout of LANs, MANs and WANs
- 1.11 describe and give examples of how networks may be categorized; e.g., topology, protocol, architecture, media
- 2. describe and demonstrate basic principles of data transmission in a computer network**
  - 2.1 describe characteristics of digital and analog signalling
  - 2.2 explain concepts and technical terms associated with data signalling and transmission including:
    - 2.2.1 propagation, modulation and encoding
    - 2.2.2 baseband and broadband signalling
    - 2.2.3 transmission speed and bandwidth
    - 2.2.4 attenuation, reflection and noise
    - 2.2.5 dispersion, jitter and latency
    - 2.2.6 data collision
  - 2.3 describe and illustrate the structure of data packets and frames
  - 2.4 explain applications of packet-sniffing software to capture and analyze data packets and frames
  - 2.5 convert binary and hexadecimal numbers to decimal numbers
  - 2.6 identify problems and solutions related to data collision in a shared media environment
- 3. describe and compare the features of bus, star, ring, mesh, wireless and hybrid topologies, Ethernet, token ring, fibre distributed data interface (FDDI) and wireless transmission methods**
  - 3.1 describe and compare the unique characteristics, advantages and disadvantages of common physical network topologies; e.g., bus, star, ring, mesh, wireless, hybrid and new topologies
  - 3.2 explain the function of network segments and backbones
  - 3.3 create schematic diagrams for the physical layout of bus, star, ring, mesh, wireless, hybrid and new topologies
  - 3.4 describe the architecture of an Ethernet network with respect to:
    - 3.4.1 physical topology
    - 3.4.2 access strategy
    - 3.4.3 carrier sense multiple access with collision detection (CSMA/CD)
    - 3.4.4 media and hardware devices
    - 3.4.5 Institute of Electrical and Electronics Engineers (IEEE) standards
  - 3.5 describe and compare the main features of token ring, FDDI, LocalTalk and wireless networks with respect to:
    - 3.5.1 topology
    - 3.5.2 methodology and access strategy
    - 3.5.3 media type
    - 3.5.4 speed
  - 3.6 select an appropriate topology and network architecture, and design a network to address user needs, given a particular set of network requirements

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE NET2040: NETWORK MEDIA & DEVICES**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop an understanding of different connectivity strategies for linking computers and other devices in a local area network (LAN). They acquire knowledge of industry standards for network cables and gain practical experience through installing cabling, connectors and other hardware components.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is given to safe processes for the installation of network cabling and connectors and to an understanding of how topology, cabling and connectors need to coexist in a network environment. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Supporting Course:** NET2020: Workstation Technology & Operations

**Outcomes:** The student will:

### **1. identify and describe the characteristics, standard names and applications for common network media and connectors**

- 1.1 identify and describe the structural components and uses of major types of network cables including:
  - 1.1.1 coaxial; e.g., thick, thin
  - 1.1.2 twisted pair; e.g., unshielded, shielded
  - 1.1.3 fibre optic
- 1.2 identify and describe the characteristics and uses of common media connectors including:
  - 1.2.1 registered jack 11 (RJ-11)
  - 1.2.2 registered jack 45 (RJ-45)
  - 1.2.3 attachment unit interface (AUI)
  - 1.2.4 British naval connector (BNC)
  - 1.2.5 small computer system interface (SCSI)
  - 1.2.6 single mode fibre optic connector; e.g., SC-type, ST-type

- 1.3 identify Institute of Electrical and Electronics Engineers (IEEE) standards for Ethernet cabling including:
  - 1.3.1 bandwidth/speed
  - 1.3.2 transmission mode
  - 1.3.3 maximum segment length
  - 1.3.4 cable type
- 1.4 identify and describe categories for unshielded twisted pair cable defined by the Electronics Industries Alliance and the Telecommunications Industry Association
- 1.5 describe the media and function of network backbones and segments
- 1.6 explain the relationship between media type, connector and topology in a network environment
- 1.7 choose an appropriate cable type and connector to add a client, given a practical network scenario
- 2. identify and explain the purpose, features and basic operation of network hardware components**
  - 2.1 explain the purpose of hardware components in:
    - 2.1.1 connecting network devices
    - 2.1.2 boosting data signals
    - 2.1.3 determining data flow
  - 2.2 demonstrate an understanding of the features, functionality and performance of basic hardware components including:
    - 2.2.1 network interface card (NIC)
    - 2.2.2 hub
    - 2.2.3 repeater
    - 2.2.4 switch
    - 2.2.5 bridge
    - 2.2.6 router
    - 2.2.7 gateway
    - 2.2.8 wireless access point
    - 2.2.9 modem
    - 2.2.10 new network technologies
  - 2.3 describe the features and functionality of power fault-tolerance hardware including:
    - 2.3.1 surge suppressor
    - 2.3.2 power line conditioner
    - 2.3.3 uninterruptible power supply
  - 2.4 choose an appropriate hardware component to use or replace an existing device, given a practical network scenario
  - 2.5 physically install a NIC and verify that the NIC is operational including:
    - 2.5.1 Ethernet
    - 2.5.2 Bluetooth
    - 2.5.3 wireless
    - 2.5.4 new technologies
- 3. demonstrate knowledge of cabling tools and procedures**
  - 3.1 demonstrate correct use of cabling tools including:
    - 3.1.1 wire crimper
    - 3.1.2 punch down tool



- 3.2 demonstrate appropriate use of basic test equipment including:
  - 3.2.1 media testers/certifiers
  - 3.2.2 crossover cable
  - 3.2.3 tone generator and probe; e.g., fox and hound
  - 3.2.4 optical testers
- 3.3 demonstrate the proper sequence of steps to crimp and test Ethernet cable
- 3.4 select the appropriate cabling tool and test equipment, given a practical cabling task
- 4. demonstrate ability to install network cabling, connectors and hardware components**
  - 4.1 demonstrate procedures for the compliant installation of:
    - 4.1.1 jacks and outlets
    - 4.1.2 cable and structured cable runs
    - 4.1.3 patch panels and patch cords
    - 4.1.4 network cards
    - 4.1.5 wired or wireless connections
  - 4.2 demonstrate appropriate use of test equipment in checking for:
    - 4.2.1 continuity
    - 4.2.2 proper grounding
    - 4.2.3 correct cable termination
  - 4.3 create a proposal for a new or refit cabling project
  - 4.4 design, build and troubleshoot a small Ethernet network at the physical layer
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE NET2050: OPEN SYSTEM INTERCONNECTION**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop knowledge of the Open System Interconnection (OSI) reference model and its use as a conceptual framework for analyzing network communication tasks. They examine the OSI reference model characteristics, the functions of each of its seven layers and how data moves between layers of the reference model when computers establish a network connection.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Primary focus should be placed on the physical, data link, network and transport layers of the OSI reference model, and on the real-world protocols and networking devices that operate at each of these layers. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Outcomes:** The student will:

### **1. describe the general purpose and structure of the OSI reference model as a conceptual framework for network communication**

- 1.1 explain the purpose of the OSI reference model as a blueprint for designing, implementing and operating network hardware and software
- 1.2 identify the functions of each of the seven layers of the OSI reference model
- 1.3 explain and diagram data transfer between layers of the OSI reference model
- 1.4 explain processes of data encapsulation and de-encapsulation in the OSI reference model
- 1.5 describe the process of data packet delivery and the function of a data frame
- 1.6 match network components and connectivity devices to the layers of the OSI reference model at which they operate
- 1.7 analyze networking tasks with respect to the OSI reference model

2. **explain and illustrate how hardware components, network protocols and encapsulation defined in lower layers of the OSI reference model move data across the network; i.e., physical layer data link layer, network layer, transport layer**
  - 2.1 identify physical layer components and their function including:
    - 2.1.1 cabling
    - 2.1.2 connectors
    - 2.1.3 network interface cards
    - 2.1.4 repeaters
    - 2.1.5 hubs
  - 2.2 describe data signalling at the physical layer
  - 2.3 identify Ethernet standards for media type and maximum segment length
  - 2.4 demonstrate ability to:
    - 2.4.1 select appropriate cables and connectors
    - 2.4.2 select, install and configure a network adapter
    - 2.4.3 terminate an Ethernet network
    - 2.4.4 test for connectivity
  - 2.5 given specific user requirements, do the following:
    - 2.5.1 design physical layer topology and components for a small Ethernet network
    - 2.5.2 create a plan for cabling based on Ethernet standards
  - 2.6 identify data link layer devices and their function; e.g., bridges, switches
  - 2.7 explain the effects of segmentation in switched networks
  - 2.8 identify data link sublayers and their function including:
    - 2.8.1 Logical Link Control (LLC) sublayer
    - 2.8.2 Media Access Control (MAC) sublayer
  - 2.9 outline Institute of Electrical and Electronics Engineers (IEEE) standards for the data link layer
  - 2.10 describe connectionless and connection-oriented services associated with the LLC sublayer
  - 2.11 explain the nature and limitations of physical addressing associated with the MAC sublayer
  - 2.12 explain applications of framing in the transport of data packets
  - 2.13 describe and illustrate the structure of a data frame
  - 2.14 explain the function of frame addressing and frame relay in the transport of data packets
  - 2.15 identify network layer devices and their function including a:
    - 2.15.1 router
    - 2.15.2 brouter
  - 2.16 explain the process of routing and the function of:
    - 2.16.1 routing metrics
    - 2.16.2 routing tables
  - 2.17 distinguish between:
    - 2.17.1 static and dynamic routing
    - 2.17.2 routable and nonroutable protocols
  - 2.18 identify common routing protocols and their function including:
    - 2.18.1 Open Shortest Path First (OSPF)
    - 2.18.2 Routing Information Protocol (RIP)
    - 2.18.3 Novell Netware Link Services Protocol (NLSP)
  - 2.19 compare physical addressing associated with the data link layer and logical addressing associated with the network layer
  - 2.20 identify logical addressing protocols and their functions including:
    - 2.20.1 Internet Protocol (IP)
    - 2.20.2 Internetwork Packet Exchange (IPX)
    - 2.20.3 new protocols for the Internet and other devices



- 2.21 identify and explain types of error checking performed at the transport layer including:
  - 2.21.1 cyclic redundancy checks
  - 2.21.2 parity bits
  - 2.21.3 checksum calculations
- 2.22 provide a rationale for flow control, and identify hardware and software solutions implemented at the transport layer
- 2.23 explain name resolution functions performed at the transport layer
- 2.24 identify common transport layer protocols and their function including:
  - 2.24.1 Transmission Control Protocol (TCP)
  - 2.24.2 User Datagram Protocol (UDP)
  - 2.24.3 Sequenced Packet Exchange (SPX)
  - 2.24.4 Apple Talk Transaction Protocol/Name Binding Protocol (ATP/NBP)
  - 2.24.5 Network Basic Input/Output System/NetBIOS enhanced user interface (NetBIOS/NetBEUI)
  - 2.24.6 new technologies and their associated protocols
- 3. explain the function of upper layers of the OSI reference model in providing client support; i.e., session layer, presentation layer, application layer**
  - 3.1 identify modes of communication associated with the session layer including:
    - 3.1.1 simplex
    - 3.1.2 half-duplex
    - 3.1.3 full-duplex
  - 3.2 describe data compression and encryption processes associated with the presentation layer
  - 3.3 identify file formats that serve as standards for the presentation layer
  - 3.4 describe network services provided by the application layer including:
    - 3.4.1 message handling
    - 3.4.2 file transfer
    - 3.4.3 database queries
  - 3.5 identify upper layer application protocols and their function including:
    - 3.5.1 Simple Mail Transfer Protocol (SMTP)
    - 3.5.2 File Transfer Protocol (FTP)
    - 3.5.3 Simple Network Management Protocol (SNMP)
- 4. demonstrate established laboratory procedures and safe work practices**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks



- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE NET2060: NETWORK PROTOCOLS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students acquire basic knowledge of upper-layer protocol suites that permit the networking of computers. They examine reasons for the extensive use of the Transmission Control Protocol/Internet Protocol (TCP/IP) in computer networks, and develop knowledge and skills relevant to installing, configuring and maintaining a TCP/IP client on a network.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on developing knowledge of TCP/IP and its suite of protocols. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Outcomes:** The student will:

- 1. describe and compare standard networking protocol suites with respect to function and addressing requirements, interoperability and naming conventions**
  - 1.1 describe the nature and purpose of a protocol and a protocol suite/stack within the context of computer networking
  - 1.2 describe and compare standard networking protocol suites including:
    - 1.2.1 TCP/IP
    - 1.2.2 Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX)
    - 1.2.3 NetBIOS extended user interface (NetBEUI)
    - 1.2.4 AppleTalk with respect to: function, routing, addressing requirements, interoperability, naming conventions, advantages and limitations
  - 1.3 match communication tasks performed within TCP/IP, IPX/SPX, NetBEUI and AppleTalk to communication tasks defined at different layers of the Open System Interconnection (OSI) reference model
  - 1.4 identify criteria involved in selecting a network protocol
  - 1.5 investigate emerging technologies and protocols

- 2. identify and explain reasons for the extensive use of the TCP/IP suite in computer networks, and identify and explain major protocols that operate within the TCP/IP suite**
  - 2.1 describe the general characteristics and features of the TCP/IP suite
  - 2.2 compare and contrast the TCP/IP suite with the OSI reference model
  - 2.3 provide reasons for the extensive use of the TCP/IP suite including:
    - 2.3.1 universal interconnectivity
    - 2.3.2 conformity with the OSI reference model
    - 2.3.3 modularity
    - 2.3.4 Internet addressing
    - 2.3.5 interoperability
  - 2.4 identify the basic function of protocols operating within the TCP/IP suite including:
    - 2.4.1 TCP
    - 2.4.2 User Datagram Protocol (UDP)
    - 2.4.3 Ip
    - 2.4.4 Address Resolution Protocol (ARP)
    - 2.4.5 File Transfer Protocol (FTP)
    - 2.4.6 Simple Mail Transfer Protocol (SMTP)
    - 2.4.7 Post Office Protocol (POP)
    - 2.4.8 Internet Message Access Protocol (IMAP)
    - 2.4.9 Internet Control Message Protocol (ICMP)
    - 2.4.10 Routing Information Protocol (RIP)
    - 2.4.11 Open Shortest Path First (OSPF)
    - 2.4.12 Hypertext Transfer Protocol (HTTP)
  - 2.5 match TCP/IP protocols to the layers of the OSI reference model on which they operate
  - 2.6 compare and contrast TCP and UDP segment formats
  - 2.7 investigate emergent technologies and protocols
- 3. demonstrate basic knowledge of logical addressing and the use of subnets and subnet masks to maximize address utilization**
  - 3.1 describe and illustrate conventions for IP addressing; e.g., structure and components, characteristics of Class A, B and C addresses
  - 3.2 convert between binary and decimal notation
  - 3.3 explain the purpose of subnetting and default gateways
  - 3.4 describe and compare classful and classless approaches to subnetting
  - 3.5 provide a rationale for implementing Classless Inter-domain Routing
  - 3.6 demonstrate processes for subnetting a Class A, B or C address into a given number of subnetworks
  - 3.7 determine the subnet mask for a subnetted network
  - 3.8 describe and compare static and dynamic approaches to IP addressing, and applications of dynamic host configuration protocol
  - 3.9 describe the concept of address resolution, and applications of ARP including:
    - 3.9.1 prepare a diagram on how ARP is used in address resolution
    - 3.9.2 describe gratuitous and proxy ARP
    - 3.9.3 interpret an ARP cache
  - 3.10 describe the concept of TCP and UDP port numbers including:
    - 3.10.1 define the function of a port
    - 3.10.2 identify the range of port numbers
    - 3.10.3 explain the function of well-known TCP/UDP ports
    - 3.10.4 investigate emergent technologies and protocols

- 4. demonstrate ability to install and configure TCP/IP on a user work station and validate, troubleshoot and manage a network connection using TCP/IP utilities**
  - 4.1 identify criteria involved in:
    - 4.1.1 planning a network
    - 4.1.2 selecting a network protocol
  - 4.2 plan and construct a small peer-to-peer or server-based network
  - 4.3 install and configure a device for TCP/IP that:
    - 4.3.1 identifies options for obtaining IP addresses
    - 4.3.2 assigns a static IP address
    - 4.3.3 assigns a subnet mask to an IP address
  - 4.4 validate, troubleshoot and manage a network connection through the use of appropriate TCP/IP utilities including:
    - 4.4.1 Simple Network Management Protocol (SNMP)
    - 4.4.2 Packet Internet Groper (PING)
    - 4.4.3 Internet Protocol configuration (IPCONFIG)
    - 4.4.4 traceroute (TRACERT)
    - 4.4.5 network statistics (NETSTAT)
- 5. demonstrate established laboratory procedures and safe work practices**
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. identify possible life roles related to the skills and content of this cluster**
  - 7.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 7.2 identify potential resources to minimize barriers and maximize opportunities





## **COURSE NET2070: LOCAL AREA NETWORKS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students extend their understanding of technologies used in a local area network (LAN) and examine specifications for an Ethernet LAN. They develop knowledge of a general strategy for network design and apply the strategy to design, implement and troubleshoot a small LAN.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on the Institute of Electrical and Electronics Engineers (IEEE) standards for cabling, and on safe procedures for preparing and connecting network media and devices. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Outcomes:** The student will:

- 1. describe and explain the nature and evolution of LAN technologies and the specific features that differentiate one LAN from another**
  - 1.1 describe the general structure and purpose of a LAN
  - 1.2 describe and compare past and present LAN technologies, with attention to their respective topologies, protocols and media including:
    - 1.2.1 attached resource computer network (ARCnet)
    - 1.2.2 LocalTalk
    - 1.2.3 Ethernet
    - 1.2.4 token ring
    - 1.2.5 fibre distributed data interface (FDDI)
    - 1.2.6 asynchronous transfer mode (ATM)
    - 1.2.7 wireless LAN (WLAN)
  - 1.3 describe new and/or emerging LAN technologies with respect to:
    - 1.3.1 physical characteristics and potential data capacities
    - 1.3.2 new applications and end-user benefits
    - 1.3.3 historical and/or business perspectives that drive development and adoption

**2. explain and demonstrate characteristics of an Ethernet LAN and strategies for improving network performance**

- 2.1 describe basic characteristics of a LAN including:
  - 2.1.1 topology or physical layout
  - 2.1.2 use of carrier sense multiple access with collision detection (CSMA/CD)
  - 2.1.3 specifications for LANs
- 2.2 identify and describe cabling and hardware devices that support data delivery across LAN including:
  - 2.2.1 cabling specifications and options
  - 2.2.2 data flow through hubs, repeaters, bridges and switches
  - 2.2.3 network interface card functions and options
  - 2.2.4 the function of terminating resistors
- 2.3 identify data transmission issues in LAN networking environments including:
  - 2.3.1 latency and bandwidth
  - 2.3.2 contention
  - 2.3.3 congestion and collision
  - 2.3.4 attenuation
- 2.4 explain the concept of segmentation and strategies used to design a collision domain by:
  - 2.4.1 describing segmentation of a collision domain by bridges, switches and routers
  - 2.4.2 illustrating the 5-4-3 rule used in 10Base-T networks
  - 2.4.3 designing and illustrating a small Ethernet collision domain network
- 2.5 explain applications of bridge and switch technology by:
  - 2.5.1 illustrating the function of learning bridges and the spanning tree protocol
  - 2.5.2 explaining the function of switches at the data link layer and network layers
  - 2.5.3 identifying different types of switching architecture including store-and-forward and cut-through data transport, and half-duplex and full-duplex network access

**3. describe the characteristics, function and benefits of a virtual local area network (VLAN)**

- 3.1 describe the structure and function of a VLAN
- 3.2 identify the benefits offered by a VLAN and specific circumstances in which a VLAN might be implemented
- 3.3 describe capabilities and functions of the following different types of VLANs:
  - 3.3.1 port-based
  - 3.3.2 address-based
  - 3.3.3 protocol-based
- 3.4 illustrate/diagram a simple VLAN configuration

**4. design and implement a small LAN**

- 4.1 outline a general strategy for network design that:
  - 4.1.1 considers the purpose of the network
  - 4.1.2 determines the overall size of the network
  - 4.1.3 selects a network topology
  - 4.1.4 determines the type of file system to be used
  - 4.1.5 selects network and client operating systems
  - 4.1.6 establishes a naming scheme and name conventions
  - 4.1.7 determines the level and type of fault-tolerance
  - 4.1.8 establishes the type and level of security required
- 4.2 design and implement a small Ethernet LAN suitable for home or office that adheres to the IEEE standards, given a specific set of network requirements including:
  - 4.2.1 select an appropriate topology and architecture
  - 4.2.2 recommend a hardware and connectivity solution

- 4.2.3 implement the solution by following safe procedures for connecting cabling and hardware devices
- 4.2.4 test the installation
- 5. analyze and troubleshoot basic problems related to LAN design and implementation**
  - 5.1 describe and compare proactive and reactive approaches to troubleshooting
  - 5.2 outline a general strategy for troubleshooting network problems that:
    - 5.2.1 establishes the symptoms
    - 5.2.2 identifies the affected area
    - 5.2.3 establishes what has changed
    - 5.2.4 selects the most probable cause
    - 5.2.5 implements a solution
    - 5.2.6 tests the results
    - 5.2.7 recognizes the potential effects of the solution
    - 5.2.8 documents the solution
  - 5.3 identify common network problems related to:
    - 5.3.1 physical topology
    - 5.3.2 client connectivity
    - 5.3.3 wiring and infrastructure
  - 5.4 identify sources of support for troubleshooting including:
    - 5.4.1 hardware/software manuals and help files
    - 5.4.2 the manufacturer's Web site
    - 5.4.3 technical support via telephone/e-mail
    - 5.4.4 use the levels of the OSI model as a troubleshooting guide to isolate the source of the problem
  - 5.5 analyze and determine the cause of a LAN implementation problem
- 6. demonstrate established laboratory procedures and safe work practices**
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. identify possible life roles related to the skills and content of this cluster**
  - 8.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 8.2 identify potential resources to minimize barriers and maximize opportunities





## **COURSE NET2080: LAPTOPS & PERIPHERALS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop an understanding of laptops, portable devices, printers and scanners. They acquire knowledge of industry standards for network cables and gain practical experience through installing cabling, connectors and other hardware components.

**Parameters:** Designed to be delivered in conjunction with other intermediate level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on Institute of Electrical and Electronics Engineers (IEEE) standards for cabling, and on safe procedures for preparing and connecting network media and devices. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Supporting Course:** NET2020: Workstation Technology & Operations

**Outcomes:** The student will:

- 1. identify the fundamental principles of using laptops and portable devices**
  - 1.1 identify names, purposes and characteristics of laptop-specific devices/hardware
  - 1.2 identify and distinguish between mobile and desktop motherboards and processors including throttling, power management and Wi-Fi
- 2. install, configure, optimize and upgrade laptops and portable devices**
  - 2.1 configure power management options
  - 2.2 demonstrate the safe removal of laptop-specific hardware such as peripherals, hot-swappable devices and non-hot-swappable devices
- 3. identify tools, basic diagnostic procedures and troubleshooting techniques for laptops and portable devices**
- 4. identify and apply common preventive maintenance techniques for laptops and portable devices; e.g., cooling devices, hardware and video cleaning materials, operating environments including temperature and air quality, storage, transportation and shipping**



- 5. identify the fundamental principles of using printers and scanners**
  - 5.1 identify differences between types of printer and scanner technologies; e.g., laser, inkjet, thermal, solid ink, impact
  - 5.2 identify names, purposes and characteristics of printer and scanner components; e.g., memory, driver, firmware, consumables such as toner, ink cartridge and paper
  - 5.3 identify the names, purposes and characteristics of interfaces used by printers and scanners including port and cable types
- 6. identify basic concepts of installing, configuring, optimizing and upgrading printers and scanners**
  - 6.1 install and configure printers/scanners
  - 6.2 optimize printer performance including:
    - 6.2.1 printer settings; e.g., tray switching
    - 6.2.2 print spool settings
    - 6.2.3 device calibration
    - 6.2.4 media types
    - 6.2.5 paper orientation
- 7. identify tools, basic diagnostic procedures and troubleshooting techniques for printers and scanners**
  - 7.1 gather information about printer/scanner problems
  - 7.2 review and analyze collected data
  - 7.3 identify solutions to identified printer/scanner problems
- 8. demonstrate established laboratory procedures and safe work practices**
- 9. demonstrate basic competencies**
  - 9.1 demonstrate fundamental skills to:
    - 9.1.1 communicate
    - 9.1.2 manage information
    - 9.1.3 use numbers
    - 9.1.4 think and solve problems
  - 9.2 demonstrate personal management skills to:
    - 9.2.1 demonstrate positive attitudes and behaviours
    - 9.2.2 be responsible
    - 9.2.3 be adaptable
    - 9.2.4 learn continuously
    - 9.2.5 work safely
  - 9.3 demonstrate teamwork skills to:
    - 9.3.1 work with others
    - 9.3.2 participate in projects and tasks
- 10. identify possible life roles related to the skills and content of this cluster**
  - 10.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 10.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE NET2110: TELECOMMUNICATIONS 1**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students learn how to select and use various wired and wireless telecommunication systems. By using the Internet, they investigate how communication principles, bandwidth, telecommunication infrastructure and wave spectrum affect telecommunication systems.

**Parameters:** Access to an appropriate computer work station, utility software, the Internet and support materials.

**Outcomes:** The student will:

- 1. use selected communication systems, protocols and techniques to transfer messages, do online activities and manage research**
  - 1.1 outline basic elements of a communication system
  - 1.2 describe the development of wired, wireless and Web-based communication systems
  - 1.3 identify key components of wired, wireless and Web-based telecommunication systems
  - 1.4 identify examples of how telecommunication systems are merging and connecting to improve service to various client groups
- 2. describe the principles of wired, wireless and Web-based communication systems and how telecommunication systems are affected by bandwidth and wave spectrum**
  - 2.1 describe how computers send and receive various types of information/data; e.g., voice, data, documents, visuals, multimedia
  - 2.2 identify and describe telecommunication transmission systems in terms of bandwidth and wave spectrum including:
    - 2.2.1 wired; e.g., twisted pair telephone cable, coaxial cable, special data cables, fibre optics
    - 2.2.2 wireless; e.g., radar/microwave, radio, satellite data links
    - 2.2.3 digital versus analog
  - 2.3 describe various types of transmission systems including:
    - 2.3.1 type of information that can be transmitted; e.g., voice, pictures
    - 2.3.2 present installation base
    - 2.3.3 user cost
- 3. compare and contrast key elements of a telecommunication infrastructure**
  - 3.1 identify key elements of an effective telecommunication infrastructure including:
    - 3.1.1 information and interactive applications/services; e.g., entertainment, education, cultural products, social services, business services, learning management systems
    - 3.1.2 transmission systems; e.g., links with/among homes, businesses, governments/education and institutions
    - 3.1.3 software applications; e.g., enable the operation of computers, manipulation of data, protection of data, transmission and reception of data and access to communication networks and their information such as social networks or learning management systems

- 3.1.4 standards and protocols that allow access to, or secure the contents of, information and networks
- 3.1.5 people/expertise needed to create the information, technology, equipment, peripherals, software and services, to provide the information, to construct the facilities and to educate others on its use and benefits
- 3.2 evaluate one or more telecommunication initiatives in terms of the key elements of an information technology infrastructure within one or more of the following areas:
  - 3.2.1 personal; e.g., personal networks, interests, learning
  - 3.2.2 electronic commerce; e.g., allows consumers/businesses to interact such as 1–800 numbers, electronic data interchange, data exchange
  - 3.2.3 health care; e.g., remote diagnostics, patient information sharing, training
  - 3.2.4 research
  - 3.2.5 education and training; e.g., distance learning/course delivery via learning management systems
  - 3.2.6 libraries; e.g., online
  - 3.2.7 government services; e.g., federal, provincial
  - 3.2.8 information services; e.g., information about government services, reports
  - 3.2.9 technology-based process/procedures, filing income taxes electronically, electronic submissions of contract bids/tendering, teleconferencing
  - 3.2.10 law enforcement services; e.g., international/national sharing of criminal data, teleconferenced parole hearings
  - 3.2.11 labour force development; e.g., flexible, readily upgraded training programs
  - 3.2.12 environmental monitoring
- 4. demonstrate established laboratory procedures and safe work practices**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE NET2910: NET PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE NET2920: NET PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

#### **1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

#### **2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

#### **3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE NET3010: DIGITAL TECHNOLOGY 3**

**Level:** Advanced

**Prerequisite:** NET2010: Digital Technology 2

**Description:** Students demonstrate and apply knowledge of digital principles by using medium-scale transistor–transistor logic (TTL) and complementary metal-oxide semiconductor (CMOS) integrated technology.

**Parameters:** Access to a digital logic trainer, a logic probe, an oscilloscope, a function generator and related materials.

**Outcomes:** The student will:

- 1. identify, interface and experiment with medium-scale integrated circuit families**
  - 1.1 explain the difference between typical and complex logic networks
  - 1.2 research and describe examples of typical and complex logic networks
- 2. identify components, construct a prototype and experiment with typical medium-scale logic networks**
  - 2.1 design and fabricate digital circuitry using medium-scale integration
  - 2.2 construct, experiment with and solve real-world applications, using medium-scale integration
  - 2.3 measure and evaluate medium-scale integrated circuits
- 3. demonstrate established laboratory procedures and safe work practices**
  - 3.1 explain and demonstrate how to avoid electrostatic discharges around integrated circuit chips, using static mats and grounding straps
  - 3.2 demonstrate an understanding of grounding, voltage and current rating of various integrated circuit families
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE NET3020: DIGITAL APPLICATIONS**

**Level:** Advanced

**Prerequisite:** NET2010: Digital Technology 2

**Description:** Students experiment with large-scale and very large-scale integrated circuits, and demonstrate their applications to practical situations.

**Parameters:** Access to logic probes, a logic analyzer, a signature analysis, oscilloscope and related materials.

**Supporting Course:** NET3010: Digital Technology 3

**Outcomes:** The student will:

- 1. identify applications and develop prototypes of large-scale integrated circuits (LSICs)**
  - 1.1 research and investigate a complex digital system
  - 1.2 identify the function of integrated circuits in a large complex digital circuit
  - 1.3 explain, experiment with and demonstrate the differences among digital memories
  - 1.4 research memory configuration and organization
  - 1.5 construct various memory circuits
  - 1.6 explain and demonstrate the differences among various digital displays and drivers
  - 1.7 explain and demonstrate the differences among various support and advanced support integrated circuits
  - 1.8 identify the application of pinouts and use of complex integrated circuit chips from several manufacturers
  - 1.9 explain and demonstrate the differences among various digital interfacing devices
  - 1.10 construct circuits using LSICs
- 2. troubleshoot a digital system or prototype with digital equipment**
  - 2.1 prototype and troubleshoot a digital system such as a calculator, computer, adder/subtractor, digital clock, frequency counter, alarm and game
  - 2.2 use one or more of the following instruments to analyze a complex digital circuit:
    - 2.2.1 logic probe
    - 2.2.2 pulser
    - 2.2.3 logic analyzer
    - 2.2.4 signature analyzer
    - 2.2.5 oscilloscope
- 3. demonstrate established laboratory procedures and safe work practices**
  - 3.1 demonstrate correct handling and storage of LSIC and very large-scale integrated circuit (VLSIC) chips
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems



- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

**COURSE NET3030: MICROPROCESSORS**

**Level:** Advanced

**Prerequisite:** NET2010: Digital Technology 2

**Description:** Students compare the internal architecture of microprocessors and program them using instruction sets.

**Parameters:** Access to a microprocessor trainer, a computer aided instruction (CAI) program and related materials.

**Supporting Courses:** NET3010: Digital Technology 3  
NET3020: Digital Applications

**Outcomes:** The student will:

- 1. compare the internal architecture of various families of microprocessors**
  - 1.1 compare the difference in internal architecture between different families of microprocessors
  - 1.2 explain the differences between machine and assembly language and interpretative and compiled languages
  - 1.3 define the following terms:
    - 1.3.1 microprocessor
    - 1.3.2 input/output
    - 1.3.3 instruction set
    - 1.3.4 operand
    - 1.3.5 mnemonic
    - 1.3.6 opcode
    - 1.3.7 data/address
  - 1.4 describe and locate the types of microprocessor used in a computer or trainer
- 2. program a microprocessor, using instruction sets**
  - 2.1 write and execute a simple straight program using mnemonic and opcodes
  - 2.2 demonstrate the uses and characteristics of different addressing modes by writing and analyzing assembly language programs
  - 2.3 compute the proper relative address for branching forward or backward from one point to another in a program
  - 2.4 write and execute a program that can:
    - 2.4.1 multiply by repeated additions
    - 2.4.2 divide by repeated subtractions
    - 2.4.3 convert binary to binary-coded decimal (BCD)
  - 2.5 write and execute simple programs that use indexed and extended addressing
  - 2.6 given an instruction, locate the opcode, calculate the number of machine cycles, find the number of bytes and give the final output
  - 2.7 write and execute a simple program that can store data in and retrieve data from the stack
  - 2.8 write and execute a program that uses the stack and indexing registers to move data between two places

### **3. describe input/output operations in microprocessors**

- 3.1 identify input/output pins of a microprocessor
- 3.2 identify erasable programmable read-only memory (EPROMS), random-access memory (RAM), integrated circuits (ICs)
- 3.3 identify memory read/write address and data pins on a memory chip
- 3.4 write and execute various programs that use memory, input and output devices
- 3.5 draw the symbols used in flowcharting and explain the purpose of each
- 3.6 define and explain how the following are used in programming:
  - 3.6.1 inherent, immediate and direct addressing
  - 3.6.2 conditional and unconditional branching
  - 3.6.3 stack operation/pointer, cascade, pop push/pull instructions
  - 3.6.4 subroutines
  - 3.6.5 carry, negative, zero, overflow, flag operation
- 3.7 explain the purpose of the following functional sections in a microprocessor:
  - 3.7.1 accumulator
  - 3.7.2 program counter
  - 3.7.3 instruction decoder
  - 3.7.4 controller
  - 3.7.5 data register
  - 3.7.6 address register
  - 3.7.7 stack pointer
  - 3.7.8 index pointer
- 3.8 explain the evolution of architecture from 8-bit on
- 3.9 draw a block diagram of an advanced microprocessor showing its internal architecture
- 3.10 identify differences between data address, instruction, flag registers
- 3.11 define a machine cycle
- 3.12 relate clock frequency to microprocessor speed

### **4. demonstrate established laboratory procedures and safe work practices**

- 4.1 be aware of potential damage to integrated circuits by static electricity
- 4.2 be aware of current and voltage requirements of computer trainers
- 4.3 demonstrate proper safety procedures while testing microprocessor pins

### **5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

### **6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals

## **COURSE NET3040: MICROPROCESSOR INTERFACE**

**Level:** Advanced

**Prerequisite:** NET3030: Microprocessors

**Description:** Students demonstrate how to interface microprocessors/microcontrollers with real-world applications.

**Parameters:** Access to a microprocessor trainer, an interfacing trainer, with an accompanying computer aided instruction (CAI) package, and related materials.

**Supporting Course:** ELT2080: Control Systems 2

**Outcomes:** The student will:

- 1. describe and explain microprocessor interface output and input circuits and the operation of a serial interface device**
  - 1.1 describe the basic difference between system boards
  - 1.2 outline the memory allocations in a typical microcomputer system using random-access memory (RAM), read-only memory (ROM), erasable programmable read-only memory (EPROM), electrically erasable read-only memory (EEROM) and input/output (I/O)
  - 1.3 define I/O as they apply to microprocessors
  - 1.4 state the two main methods of I/O operation in microprocessors
  - 1.5 describe a simplified microprocessor interface device
  - 1.6 define the term "interrupt"
  - 1.7 explain the bus structure of a typical microprocessor system
  - 1.8 explain three-state logic
  - 1.9 draw a simplified block diagram of an interface device and explain the purpose of the data, control and data direction registers
  - 1.10 write a simple program that will configure an interface device in any I/O combination
  - 1.11 describe how serial data can be represented using both amplitude and frequency modulation techniques
  - 1.12 explain the difference between asynchronous and synchronous serial data transmission
  - 1.13 explain how to interface ROM, EPROM or RAM
  - 1.14 define the difference between a universal asynchronous receiver/transmitter (UART), BSRT and universal synchronous receiver/transmitter (USART) device
  - 1.15 write and execute a program to convert serial data to parallel data and parallel data to serial data
- 2. interface a digital-to-analog (D/A) and analog-to-digital (A/D) converter to a microprocessor**
  - 2.1 research/experiment with some of the following concepts that apply to microprocessors:
    - 2.1.1 interface a D/A converter to a microprocessor system
    - 2.1.2 describe how D/A converters are used to control the direction of rotation, speed and position of DC motors
    - 2.1.3 define the function of a servo amplifier in a motor control circuit
    - 2.1.4 describe and provide an example of a microprocessor-based industrial control system
    - 2.1.5 construct a microprocessor-controlled thermometer
    - 2.1.6 construct a microprocessor-controlled silicon-controlled rectifier (SCR) or bidirectional triode thyristor (TRIAC) circuit



- 2.1.7 explain how a microprocessor can control the effective current to a load using an SCR or TRIAC
- 2.1.8 state the advantages of using an opto-isolator in a microprocessor control circuit
- 2.1.9 design, construct and explain a microprocessor/stepper motor interface and control circuit
- 2.1.10 explain how a microprocessor is used to control exhaust emissions and fuel economy in an automobile
- 2.1.11 explain how microprocessors can be used to control a robot
- 2.2 explain how multiple microprocessors are used in advanced personal computer and business systems
- 2.3 describe several microprocessor applicators in the aviation and medical industries
- 2.4 explain several business applications of microprocessors including computers, word processors, copiers/printers, registers and inventory control
- 2.5 list several other consumer product applications of a microprocessor
- 3. connect a microprocessor to a sensor device used in home, industrial and/or transportation applications**
  - 3.1 construct, connect, interface and operate a microprocessor with devices including:
    - 3.1.1 photo resistive
    - 3.1.2 temperature and optical sensors
    - 3.1.3 photo diodes and photo transistors
    - 3.1.4 optical interrupter and optical reflectors
    - 3.1.5 optocouplers
    - 3.1.6 Hall effect devices
    - 3.1.7 DC motors
  - 3.2 construct a project incorporating a microprocessor/microcontroller to control the operation of:
    - 3.2.1 robots
    - 3.2.2 weather stations
    - 3.2.3 home environment systems
    - 3.2.4 security systems
    - 3.2.5 automotive applications
    - 3.2.6 modems/communication devices
  - 3.3 construct a project using EPROM's memory and various interface devices
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 describe voltage/current transients in real-world applications that connect to low voltage computers
  - 4.2 safely interface computers to real-world applications
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely



- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE NET3050: NETWORK OPERATING SYSTEMS**

**Level:** Advanced

**Prerequisites:** NET2030: Network Structures  
NET2040: Network Media & Devices  
NET2050: Open System Interconnection  
NET2060: Network Protocols  
NET2070: Local Area Networks

**Description:** Students examine the features, advantages and disadvantages of major network operating systems and the criteria involved in selecting network operating systems that are appropriate in specific networking environments. They develop the knowledge and skills required to install and configure different network and client operating systems and develop a strategy for troubleshooting problems resulting from the installation of operating system software.

**Parameters:** Designed to be delivered in conjunction with other advanced level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on current versions of commonly used network operating systems (e.g., Microsoft Windows, Novell NetWare, Apple Macintosh, UNIX/Linux), and client operating systems (e.g., Microsoft Windows, Apple Macintosh, UNIX/Linux). Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Outcomes:** The student will:

- 1. identify the generic functions and administrative tasks common to all network operating systems**
  - 1.1 compare and contrast peer-to-peer and server-based networks
  - 1.2 describe the role of a network operating system in server-based networks including:
    - 1.2.1 connect computers and peripheral devices and service requests for resources
    - 1.2.2 manage access to data and shared resources
    - 1.2.3 monitor performance and activities of the network
  - 1.3 identify generic tasks and administrative functions common to all network operating systems including:
    - 1.3.1 file services
    - 1.3.2 print services

- 1.3.3 directory services
- 1.3.4 security services
- 1.3.5 messaging services
- 1.3.6 routing services
- 1.3.7 network administrative services
- 2. **describe and compare the capabilities and functions of network operating systems in common use; e.g., Microsoft Windows, Novell NetWare, MAC OS, UNIX/Linux**
  - 2.1 describe and compare the:
    - 2.1.1 evolution and major features
    - 2.1.2 associated protocols and interoperability
    - 2.1.3 client support
    - 2.1.4 authentication and security
    - 2.1.5 file, print and directory services
    - 2.1.6 routing services
- 3. **identify and analyze criteria relevant to planning, selecting and implementing a network operating system**
  - 3.1 identify criteria involved in network planning including:
    - 3.1.1 the need for and benefits of network planning
    - 3.1.2 specific criteria and steps involved in network planning
    - 3.1.3 interoperability with the installed base and existing network standards
  - 3.2 explain criteria involved in selecting a network operating system including:
    - 3.2.1 client needs/required services
    - 3.2.2 user base and budget
    - 3.2.3 client software and associated protocols
    - 3.2.4 hardware requirements
    - 3.2.5 client licensing
  - 3.3 identify hardware devices and software tools used in network planning
  - 3.4 identify key differences among common network operating systems
  - 3.5 identify network operating systems that are appropriate in specific networking environments
  - 3.6 analyze the needs of a small company and recommend an appropriate network operating system
- 4. **demonstrate ability to install and configure two or more network operating systems and compatible network clients**
  - 4.1 install and configure two or more different network operating systems including:
    - 4.1.1 partition and format drive
    - 4.1.2 name server and network
    - 4.1.3 install and configure protocol
    - 4.1.4 select network services
    - 4.1.5 establish and confirm licensing
    - 4.1.6 set administrative passwords
    - 4.1.7 install peripherals
    - 4.1.8 share resources and set permissions
  - 4.2 install and configure a network client to interact with and access the resources of each network operating system that is installed including:
    - 4.2.1 configure an appropriate client operating system
    - 4.2.2 install and configure protocol
    - 4.2.3 assign computer/host name and user name
    - 4.2.4 select network services
    - 4.2.5 set an acceptable/secure password

- 4.3 identify the function of and configure common network services including:
  - 4.3.1 dynamic host configuration protocol (DHCP)
  - 4.3.2 bootstrap protocol (BOOTP)
  - 4.3.3 domain name service (DNS)
  - 4.3.4 network address translation/Internet connection sharing (NAT/ICS)
  - 4.3.5 Windows Internet Name Service (WINS)
  - 4.3.6 Simple Network Management Protocol (SNMP)
- 4.4 demonstrate processes for:
  - 4.4.1 sharing and accessing a folder
  - 4.4.2 assigning permissions
  - 4.4.3 sharing a printer
  - 4.4.4 sharing devices
- 5. demonstrate ability to analyze and troubleshoot connectivity problems related to the installation of operating system software**
  - 5.1 outline a general strategy for troubleshooting network problems by:
    - 5.1.1 establishing the symptoms
    - 5.1.2 identifying the affected area
    - 5.1.3 establishing what has changed
    - 5.1.4 selecting the most probable cause
    - 5.1.5 implementing a solution
    - 5.1.6 testing the results
    - 5.1.7 recognizing the potential effects of the solution
    - 5.1.8 documenting the solution
  - 5.2 analyze and troubleshoot connectivity problems resulting from the installation of a network and/or client operating system by:
    - 5.2.1 using appropriate diagnostic commands and utilities
    - 5.2.2 interpreting visual indicators
    - 5.2.3 predicting the impact of adding, removing and/or modifying network services
  - 5.3 use protocol analysis software to analyze basic network utilization and frame statistics
- 6. demonstrate established laboratory procedures and safe work practices**
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. create a transitional strategy to accommodate personal changes and build personal values**
  - 8.1 identify short-term and long-term goals
  - 8.2 identify steps to achieve goals





## **COURSE NET3060: WIDE AREA NETWORKS**

**Level:** Advanced

**Prerequisites:** NET2030: Network Structures  
NET2040: Network Media & Devices  
NET2050: Open System Interconnection  
NET2060: Network Protocols  
NET2070: Local Area Networks

**Description:** Students develop basic knowledge of the technologies employed in a wide area network (WAN) and of how a WAN may be used to connect local area networks (LANs) at different locations. Students gain practical experience in using WAN technologies to establish remote network access and they analyze emerging WAN technologies with respect to the impact on global networking.

**Parameters:** Designed to be delivered in conjunction with other advanced level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other vendor-specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on introductory level knowledge of WAN concepts, and on the application of WAN technologies. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Outcomes:** The student will:

- 1. describe the general structure, function and communication services provided by a WAN**
  - 1.1 describe and illustrate the basic structure and function of a WAN
  - 1.2 compare and contrast the structure of and communication services provided by:
    - 1.2.1 LANs, metropolitan area networks (MANs) and WANs
    - 1.2.2 public networks, private networks and virtual private networks (VPNs)
  - 1.3 describe and give examples of:
    - 1.3.1 analog and digital carrier systems and services
    - 1.3.2 major standards for digital carrier services including: data signaling standards, T- and E-carrier standards
  - 1.4 describe basic processes of modulation, synchronization and multiplexing in a WAN

- 1.5 describe and compare:
  - 1.5.1 dial-up and dedicated connections
  - 1.5.2 asynchronous and synchronous modems
  - 1.5.3 new technologies for WAN connections including: Bluetooth, wireless, ultra wideband
- 1.6 identify common types of lease lines and the advantages and disadvantages associated with dedicated lease lines
- 2. explain, compare and contrast how typical circuit-switching and packet-switching sessions work**
  - 2.1 explain and illustrate how a typical circuit-switching and packet-switching session works
  - 2.2 compare design features of switched virtual circuits and permanent virtual circuits
  - 2.3 describe the physical characteristics (i.e., speed, capacity, media, basic functions and user services) including:
    - 2.3.1 common circuit-switching technologies; e.g., integrated services digital network (ISDN), digital subscriber line (DSL), wireless, new network technology
    - 2.3.2 common packet-switching technologies such as: x.25, frame relay, asynchronous transfer mode (ATM), synchronous optical network/synchronous digital hierarchy (SONET/SDH), new packet technology
  - 2.4 define the concept of quality of service
  - 2.5 compare the quality of service offered by selected circuit-switching and packet-switching technologies
  - 2.6 explain WAN design considerations related to:
    - 2.6.1 committed information rate
    - 2.6.2 error rate and packet loss
- 3. demonstrate applications of WAN technology in providing network users with remote access**
  - 3.1 describe and compare different approaches used to provide network users with remote access including:
    - 3.1.1 dial-up connections
    - 3.1.2 VPN connections
    - 3.1.3 wireless
    - 3.1.4 new technologies
  - 3.2 explain the function of a remote access server and common remote access protocols and services including:
    - 3.2.1 Serial Line Internet Protocol (SLIP)
    - 3.2.2 Point-to-Point Protocol (PPP)
    - 3.2.3 Point-to-Point Tunnelling Protocol (PPTP)
    - 3.2.4 Independent Computing Architecture (ICA)
    - 3.2.5 Multi-protocol Label Switching (MPLS)
    - 3.2.6 new protocols
  - 3.3 recommend a remote access connectivity solution and select a remote access protocol/service, given a need for remote connectivity in a small office or home office scenario

- 4. identify and describe security issues in a WAN and the function of network security protocols and methods**
  - 4.1 identify internal and external security issues in a WAN
  - 4.2 identify the purpose and components of a network security policy
  - 4.3 describe/illustrate the purpose and function of the following common security protocols:
    - 4.3.1 Internet Protocol Security (IPSec)
    - 4.3.2 Kerberos
    - 4.3.3 Layer 2 Tunnelling Protocol (L2TP)
    - 4.3.4 Secure Sockets Layer (SSL)
    - 4.3.5 new protocols
  - 4.4 explain the purpose, characteristics and benefits of a:
    - 4.4.1 firewall
    - 4.4.2 proxy server
  - 4.5 predict the impact of implementing a particular security strategy on network functionality
- 5. analyze emerging WAN technologies with respect to design, evolution and impact on global networking**
  - 5.1 identify and briefly describe five or more emerging WAN technologies
  - 5.2 analyze three or more emerging WAN technologies, including any of the following, with respect to elements of design, historical evolution and benefits to global networking:
    - 5.2.1 plain old telephone system (POTS), xDSL, Integrated Service Digital Network (ISDN) and cable, as examples of last mile solutions
    - 5.2.2 technologies designed to address bandwidth requirements
    - 5.2.3 Internet Protocol (IP) version 6
    - 5.2.4 tunnelling protocols
    - 5.2.5 VPN solutions
    - 5.2.6 wireless/satellite networks
    - 5.2.7 Internet telephony
    - 5.2.8 voice-over-Internet protocol
    - 5.2.9 ultra wideband networking
    - 5.2.10 emerging networking technologies
- 6. demonstrate established laboratory procedures and safe work practices**
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. create a transitional strategy to accommodate personal changes and build personal values**
  - 8.1 identify short-term and long-term goals
  - 8.2 identify steps to achieve goals





## **COURSE NET3070: ROUTING FUNDAMENTALS**

**Level:** Advanced

**Prerequisites:** NET2030: Network Structures  
NET2040: Network Media & Devices  
NET2050: Open System Interconnection  
NET2060: Network Protocols  
NET2070: Local Area Networks

**Description:** Students extend their knowledge of wide area networks (WANs) by examining the process used to route information through an internetwork. They examine the major functions and components of a router, develop knowledge of common routing protocols and gain practical experience in basic router configuration.

**Parameters:** Designed to be delivered in conjunction with other advanced level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on introductory level knowledge of the processes used to route information through larger networks and on the Internet Protocol (IP) addressing scheme. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Outcomes:** The student will:

- 1. describe the process of routing data through an internetwork, and describe the major functions of a router**
  - 1.1 describe the characteristics of internetworks and the path determination function of a router
  - 1.2 compare and contrast the functions of bridges, switches, routers and gateways
  - 1.3 describe and illustrate basic router operations including:
    - 1.3.1 the routing of data packets from source to destination
    - 1.3.2 the sequence of encapsulation during routing
    - 1.3.3 functions of a routing information table
    - 1.3.4 the nature of commonly used routing metrics
  - 1.4 explain and give examples of:
    - 1.4.1 static and dynamic routing
    - 1.4.2 routable and nonroutable protocols
  - 1.5 construct a model of a router topology

**2. explain and analyze the addressing and routing function of protocols operating at the network layer of the open system interconnection (OSI) reference model**

- 2.1 describe and illustrate the function of IP addresses in a routed network including:
  - 2.1.1 host addresses and broadcast addresses
  - 2.1.2 subnetting and default gateways
- 2.2 explain and interpret standard conventions for IP addressing:
  - 2.2.1 IP version 4 (Class A, B and C) addresses and their default subnet masks
  - 2.2.2 classless inter-domain routing (CIDR) and the format for IP versions and addressing
- 2.3 identify and describe ways in which new IP versions may affect routing
- 2.4 explain and interpret the process of address resolution including:
  - 2.4.1 analyze the function of the address resolution protocol (ARP) and interpret an ARP cache
  - 2.4.2 describe the function and purpose of the reverse address resolution protocol (RARP)
- 2.5 compare major features of local area network (LAN)-to-LAN routing and LAN-to-WAN routing
- 2.6 describe and give examples of:
  - 2.6.1 distance-vector and link-state routing protocols
  - 2.6.2 interior and exterior routing protocols
- 2.7 explain the basic architecture and operation of the following common routing protocols:
  - 2.7.1 Routing Information Protocol (RIP)
  - 2.7.2 Open Shortest Path First (OSPF)
  - 2.7.3 Border Gateway Protocol (BGP)
- 2.8 explain and give examples of inter-autonomous, intra-autonomous and pass-through routing

**3. demonstrate knowledge of router components, commands and configuration processes**

- 3.1 identify and describe external configuration sources and internal configuration components
- 3.2 describe the uses of random-access memory (RAM) for working storage in a router
- 3.3 identify and describe router modes
- 3.4 identify and describe router help functions
- 3.5 interpret and use:
  - 3.5.1 basic show and test commands
  - 3.5.2 startup sequence and setup commands
  - 3.5.3 configuration files and modes
- 3.6 identify and describe the following routing protocols
  - 3.6.1 RIP
  - 3.6.2 OSPF
  - 3.6.3 Interior Gateway Routing Protocol (IGRP)/Enhanced Interior Gateway Routing Protocol (EIGRP)
  - 3.6.4 BGP
  - 3.6.5 Cisco Discovery Protocol (CDP)
  - 3.6.6 other protocols
- 3.7 describe and configure access control lists (ACLs) including:
  - 3.7.1 standard and extended ACLs
- 3.8 perform basic router configuration routines by:
  - 3.8.1 demonstrating router startup and login procedures
  - 3.8.2 using command history and editing features
  - 3.8.3 configuring and verifying IP addresses
  - 3.8.4 configuring RIPs
  - 3.8.5 configuring and modifying standard and extended ACLs
- 3.9 demonstrate the ability to troubleshoot a routing loop

- 3.10 prepare a flowchart illustrating the router configuration process
- 3.11 configure a router for a standard five-router topology
- 4. describe and explain methods used to manage and monitor network routing**
  - 4.1 describe Simple Network Management Protocol (SNMP) and its purpose in routing
  - 4.2 identify SNMP architecture and message formats
  - 4.3 describe management information base structure and name representation
  - 4.4 identify basic SNMP commands and security levels
- 5. demonstrate established laboratory procedures and safe work practices**
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals



## **COURSE NET3080: INTERNET PROCESSES**

**Level:** Advanced

**Prerequisites:** NET2030: Network Structures  
NET2040: Network Media & Devices  
NET2050: Open System Interconnection  
NET2060: Network Protocols  
NET2070: Local Area Networks

**Description:** Students apply their knowledge of Wide Area Network (WAN) technologies to an Internet environment. Course content focuses on the significance and utility of Internet Protocol (IP) addressing schemes in Internet communication and on the function of WAN protocols and services in providing Internet access. Students develop knowledge of internetworking career paths and related educational opportunities.

**Parameters:** Designed to be delivered in conjunction with other advanced level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on reinforcing and applying previously developed knowledge and skills in an Internet environment and on explaining how and why particular technologies are employed. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Outcomes:** The student will:

- 1. describe and analyze the historical roots, basic architecture and functions of the Internet in global communication**
  - 1.1 describe the origin and evolution of the Internet
  - 1.2 describe and illustrate the basic architecture of the Internet
  - 1.3 explain the nature and function of services provided by the Internet
  - 1.4 analyze the impact of the Internet on economic, social and political systems
  - 1.5 identify and explain contributions of emerging wired or wireless technologies in global Internet communication
- 2. develop a rationale for, and demonstrate the use of, IP addressing schemes, subnets and subnet masks in Internet communication**
  - 2.1 explain the function of IP addressing, subnets and subnet masks in Internet communication
  - 2.2 describe methods for assigning an IP address



- 2.3 identify classes of IP addresses and the purpose of reserved address space
- 2.4 subnet a Class A, B or C address into a given number of subnetworks
- 2.5 determine the subnet mask for a subnetted network
- 2.6 optimize a host/subnet scheme
- 2.7 compare connectionless and connection-oriented networking processes
- 2.8 identify problems and solutions associated with traditional IP addressing
- 2.9 identify advantages of new IP
- 3. explain and compare the function of selected WAN protocols and services and their utility in providing access to the Internet**
  - 3.1 explain the significance of the Transmission Control Protocol/Internet Protocol (TCP/IP) suite within an Internet environment
  - 3.2 describe common WAN protocols and services, including Dynamic Host Configuration Protocol (DHCP), Address Resolution Protocol (ARP), Domain Name Service (DNS), Integrated Services Digital Network (ISDN), and Point-to-Point Protocol (PPP), with respect to:
    - 3.2.1 function
    - 3.2.2 architecture
    - 3.2.3 configuration
    - 3.2.4 benefits
    - 3.2.5 possible design issues
- 4. identify and assess methods for connecting a local network infrastructure with the Internet**
  - 4.1 identify criteria involved in network planning
  - 4.2 identify and assess options for connecting a network to the Internet
  - 4.3 describe current and investigate new methods for securing IP traffic between a local network and a service provider
  - 4.4 explain applications of network address translation (NAT) in sharing an Internet connection
  - 4.5 plan a strategy for Internet connectivity, given needs within a local network for access to the Internet
- 5. demonstrate established laboratory procedures and safe work practices**
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE NET3090: NETWORK MANAGEMENT**

**Level:** Advanced

**Prerequisites:** NET2030: Network Structures  
NET2040: Network Media & Devices  
NET2050: Open System Interconnection  
NET2060: Network Protocols  
NET2070: Local Area Networks

**Description:** Students acquire knowledge of internal and external risks to a network and develop strategies for protecting network data and securing a network. They also develop and apply a general strategy for troubleshooting network problems and acquire knowledge of the basic roles and responsibilities associated with network maintenance and support.

**Parameters:** Designed to be delivered in conjunction with other advanced level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on risks and problems most common to a small network and on the ability to apply troubleshooting strategies, tools and commands in specific situations. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Outcomes:** The student will:

- 1. provide a rationale for protecting network data and describe major components of a data backup strategy**
  - 1.1 give reasons for protecting data in a local area network (LAN)
  - 1.2 describe the nature, scope and source of potential risks to data in a LAN
  - 1.3 identify and describe major components of a data backup strategy including:
    - 1.3.1 redundancy
    - 1.3.2 fault-tolerance
    - 1.3.3 data backup
    - 1.3.4 uninterruptible power supply
  - 1.4 design an appropriate data backup strategy, given a small office or home office network scenario

- 2. analyze security risks in a LAN and describe steps that can be taken to secure a network**
  - 2.1 give reasons for network security
  - 2.2 describe the nature, scope and source of internal and external security risks in a LAN environment
  - 2.3 identify the characteristics of threats imposed by:
    - 2.3.1 viruses, worms, Trojan horses and other new attack technologies
    - 2.3.2 direct attacks such as:
      - 2.3.2.1 eavesdropping
      - 2.3.2.2 password attacks
    - 2.3.3 Internet Protocol (IP) address spoofing
  - 2.4 identify and describe strategies for protecting a LAN from internal and external risks including:
    - 2.4.1 user authentication, access permissions and account options
    - 2.4.2 share permissions and user group access rights
    - 2.4.3 virus protection
    - 2.4.4 firewalls
    - 2.4.5 data encryption
  - 2.5 design an appropriate security plan, given a small office or home office network scenario
- 3. demonstrate an understanding of the functions and key roles of network maintenance and support in an organization**
  - 3.1 outline considerations that are required to maintain and support an operating network including:
    - 3.1.1 anticipated activities
    - 3.1.2 data integrity
    - 3.1.3 hardware and software standards
    - 3.1.4 repair policies
    - 3.1.5 system monitoring
    - 3.1.6 training
  - 3.2 identify benefits associated with network maintenance and support
  - 3.3 identify and describe key functions and roles related to network maintenance and support activities including:
    - 3.3.1 network maintenance policies
    - 3.3.2 network documentation
    - 3.3.3 vendor upgrades
    - 3.3.4 system backup
  - 3.4 identify hardware devices/software tools used to gather information to assist network maintenance and support activities
  - 3.5 develop a plan to maintain and support an operating network
- 4. use appropriate strategies, tools and commands to troubleshoot common network problems**
  - 4.1 describe the most common sources of network problems in a LAN including:
    - 4.1.1 user error
    - 4.1.2 software
    - 4.1.3 physical connectivity
  - 4.2 demonstrate the safe use of troubleshooting tools
  - 4.3 demonstrate the use of the following appropriate software commands to check configuration or connectivity:
    - 4.3.1 Internet Protocol configuration (IPCONFIG)
    - 4.3.2 Packet Internet Groper (PING)
    - 4.3.3 traceroute (TRACERT)

- 4.4 outline a general strategy for troubleshooting network problems that:
  - 4.4.1 establishes the symptoms
  - 4.4.2 identifies the affected area
  - 4.4.3 establishes what has changed
  - 4.4.4 selects the most probable cause
  - 4.4.5 implements a solution
  - 4.4.6 tests the results
  - 4.4.7 recognizes the potential effects of the solution
  - 4.4.8 documents the solution
- 4.5 use appropriate strategies, tools and commands, given a small office or home office network scenario, to troubleshoot common network problems related to:
  - 4.5.1 a particular physical topology
  - 4.5.2 client connectivity
  - 4.5.3 wiring and/or infrastructure
  - 4.5.4 remote connectivity
- 5. demonstrate established laboratory procedures and safe work practices**
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals





## **COURSE NET3100: NETWORK MEDIA & DEVICES, SECURITY**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop an understanding of different connectivity strategies for linking computers and security devices in a local area network (LAN). They acquire knowledge of industry standards for network cables and gain practical experience through installing cabling, connectors and other hardware components.

**Parameters:** Designed to be delivered in conjunction with other intermediate and advanced level courses in computer networking systems. Schools have the option of delivering courses in conjunction with one or more project courses if they wish to extend learning and/or address other specific technologies.

Access to an appropriate computer work station, the Internet, networking hardware, software and tools, and consumable supplies.

Access to instruction from an individual with specialized knowledge and skills in computer networking.

Particular emphasis is placed on Institute of Electrical and Electronics Engineers (IEEE) standards for cabling, and on safe procedures for preparing and connecting network media and devices. Students model and assume personal responsibility for ethical behaviour in their use of networking technologies and in their access to electronic sources of information. They also demonstrate an understanding of industry-based policies regarding network use and security.

**Supporting Course:** NET2020: Workstation Technology & Operations

**Outcomes:** The student will:

### **1. identify and describe the characteristics, standard names and applications for common network media and connectors**

1.1 identify and describe the structural components and uses of major types of network cables including:

- 1.1.1 coaxial; e.g., thick, thin
- 1.1.2 twisted pair; e.g., unshielded, shielded
- 1.1.3 fibre optic

1.2 identify and describe the characteristics and uses of common media connectors including:

- 1.2.1 registered jack 11 (RJ-11)
- 1.2.2 registered jack 45 (RJ-45)
- 1.2.3 attachment unit interface (AUI)
- 1.2.4 British naval connector (BNC)
- 1.2.5 small computer system interface (SCSI)
- 1.2.6 single mode fibre optic connector; e.g., SC-type, ST-type

- 1.3 identify IEEE standards for Ethernet cabling including:
  - 1.3.1 bandwidth/speed
  - 1.3.2 transmission mode
  - 1.3.3 maximum segment length
  - 1.3.4 cable type
- 1.4 identify and describe categories for unshielded twisted pair cable defined by the Electronics Industries Alliance and the Telecommunications Industry Association
- 1.5 describe the media and function of network backbones and segments
- 1.6 explain the relationship between media type, connector and topology in a network environment
- 1.7 choose an appropriate cable type and connector to add a client, given a practical network scenario
- 2. identify and explain the purpose, features and basic operation of network hardware components**
  - 2.1 explain the purpose of hardware components in:
    - 2.1.1 connecting network devices
    - 2.1.2 boosting data signals
    - 2.1.3 determining data flow
  - 2.2 demonstrate an understanding of the features, functionality and performance of basic hardware components including:
    - 2.2.1 network interface card
    - 2.2.2 hub
    - 2.2.3 repeater
    - 2.2.4 switch
    - 2.2.5 bridge
    - 2.2.6 router
    - 2.2.7 gateway
    - 2.2.8 wireless access point
    - 2.2.9 modem
- 3. demonstrate knowledge of cabling tools and demonstrate the ability to install network cabling, connectors and hardware components**
  - 3.1 identify layers of the open system interconnection (OSI) reference model at which specific hardware components operate
  - 3.2 describe the features and functionality of power fault-tolerance hardware such as:
    - 3.2.1 surge suppressor
    - 3.2.2 power line conditioner
    - 3.2.3 uninterruptible power supply
  - 3.3 choose an appropriate hardware component to use or replace an existing device, given a practical network scenario
  - 3.4 physically install a network interface card and verify that the card is operational
  - 3.5 demonstrate the correct use of cabling tools; e.g., wire crimper, punch down tool
  - 3.6 demonstrate the appropriate use of basic test equipment including:
    - 3.6.1 media testers/certifiers
    - 3.6.2 crossover cables
    - 3.6.3 tone generators and probes; e.g., fox and hound
    - 3.6.4 optical testers
  - 3.7 demonstrate the proper sequence of steps to crimp and test Ethernet cable
  - 3.8 select the appropriate cabling tool and test equipment, given a practical cabling task

#### **4. demonstrate established laboratory procedures and safe work practices**

- 4.1 demonstrate procedures for compliant installation of:
  - 4.1.1 jacks and outlets
  - 4.1.2 cable and structured cable runs
  - 4.1.3 patch panels and patch cords
  - 4.1.4 network cards
  - 4.1.5 a wired or wireless connection
- 4.2 demonstrate the appropriate use of test equipment in checking for:
  - 4.2.1 continuity
  - 4.2.2 proper grounding
  - 4.2.3 correct cable termination
- 4.3 create a proposal for a new or refit cabling project
- 4.4 design, build and troubleshoot a small Ethernet network

#### **5. identify the fundamental principles of networks**

- 5.1 describe basic networking concepts including:
  - 5.1.1 addressing
  - 5.1.2 bandwidth
  - 5.1.3 status indicators
  - 5.1.4 protocols; e.g., Internet Protocol Suite (TCP/IP) including Internet Protocol (IP), classful subnet, Internetwork Packet Exchange/Sequenced Packet Exchange (IPX/SPX) including network basic input/output system
  - 5.1.5 full-duplex, half-duplex
  - 5.1.6 cabling; e.g. twisted pair, coaxial cable, fibre optic, RS-232, USB, IEEE 1394/Firewire
  - 5.1.7 networking models including peer-to-peer and client/server
- 5.2 identify names, purposes and characteristics of the common network cables including:
  - 5.2.1 plenum/PVC
  - 5.2.2 unshielded twisted pair (UTP); e.g., CAT3, CAT5/5e, CAT6
  - 5.2.3 shielded twisted pair (STP)
  - 5.2.4 fiber; e.g., single-mode and multi-mode
- 5.3 identify names, purposes and characteristics of network connectors; e.g., RJ-45, RJ-11, ST/SC/LC, MT-RJ
- 5.4 Identify names, purposes and characteristics (e.g., definition, speed, connections) of the following technologies for establishing connectivity:
  - 5.4.1 LAN/Wide Area Network (WAN)
  - 5.4.2 Integrated Services Digital Network (ISDN)
  - 5.4.3 broadband; e.g., Digital Subscriber Line (DSL), cable, satellite
  - 5.4.4 dial-up
  - 5.4.5 wireless standards, all 802.11
  - 5.4.6 infrared
  - 5.4.7 Bluetooth
  - 5.4.8 cellular
  - 5.4.9 Voice over Internet Protocol (VoIP)

#### **6. identify the fundamental principles of security**

- 6.1 identify names, purposes and characteristics of hardware and software security including:
  - 6.1.1 hardware deconstruction/recycling
  - 6.1.2 smart cards/biometrics; e.g., key fobs, cards, chips, scans
  - 6.1.3 authentication technologies; e.g., password, biometrics, smart cards
  - 6.1.4 malicious software protection; e.g., viruses, Trojans, worms, spam, spyware, adware, grayware

- 6.1.5 software firewalls
- 6.1.6 file system security; e.g., file allocation table (FAT)32 and Windows NT File System (NTFS)
- 6.2 identify names, purposes and characteristics of wireless security including:
  - 6.2.1 wireless encryption; e.g., Wired Equivalent Privacy (WEP), Wi-Fi Protected Access (WPA), client configuration
  - 6.2.2 access points; e.g. disable Dynamic Host Configuration Protocol (DHCP)/use static IP, change service set identifiers (SSID) from default, disable SSID broadcast, Media Access Control (MAC) filtering, change default user name and password, update firmware, firewall
- 6.3 identify names, purposes and characteristics of data and physical security
  - 6.3.1 data access; e.g., basic local security policy
  - 6.3.2 encryption technologies
  - 6.3.3 backups
  - 6.3.4 data migration
  - 6.3.5 data/remnant removal
  - 6.3.6 password management
  - 6.3.7 locking work station; e.g., hardware, operating system
- 6.4 describe the importance and process of incidence reporting
- 6.5 recognize and respond appropriately to social engineering situations
- 6.6 install, configure, upgrade and optimize hardware, software and data security including:
  - 6.6.1 Basic Input/Output System (BIOS)
  - 6.6.2 smart cards
  - 6.6.3 authentication technologies
  - 6.6.4 malicious software protection
  - 6.6.5 data access; e.g., basic local security policy
  - 6.6.6 backup procedures and access to backups
  - 6.6.7 data migration
  - 6.6.8 data/remnant removal
- 6.7 implement software security preventive maintenance techniques such as installing service packs and patches and training users about malicious software prevention technologies
- 6.8 diagnose and troubleshoot hardware, software and data security issues including:
  - 6.8.1 BIOS
  - 6.8.2 smart cards, biometrics
  - 6.8.3 authentication technologies
  - 6.8.4 malicious software
  - 6.8.5 file system; e.g., FAT32, NTFS
  - 6.8.6 data access; e.g., basic local security policy
  - 6.8.7 backup
  - 6.8.8 data migration
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems



- 7.2 demonstrate personal management skills to:
  - 7.2.1 demonstrate positive attitudes and behaviours
  - 7.2.2 be responsible
  - 7.2.3 be adaptable
  - 7.2.4 learn continuously
  - 7.2.5 work safely
- 7.3 demonstrate teamwork skills to:
  - 7.3.1 work with others
  - 7.3.2 participate in projects and tasks
- 8. create a transitional strategy to accommodate personal changes and build personal values**
  - 8.1 identify short-term and long-term goals
  - 8.2 identify steps to achieve goals





## **COURSE NET3110: TELECOMMUNICATIONS 2**

**Level:** Advanced

**Prerequisite:** NET2110: Telecommunications 1

**Description:** Students demonstrate knowledge of telecommunication systems by designing a new system. They use the Internet in researching and developing their design and for comparing and contrasting various telecommunication initiatives. Students analyze the effect this is having on the individual and society.

**Parameters:** Access to an appropriate computer work station, utility software, the Internet and support materials.

**Outcomes:** The student will:

- 1. use appropriate telecommunication systems, protocols and techniques to transfer messages and manage research**
  - 1.1 create a telecommunication solution that improves communication options for individuals, business and society
  - 1.2 compare and contrast various types of transmission systems including:
    - 1.2.1 type of information that can be transmitted
    - 1.2.2 present installation base
    - 1.2.3 ability to connect with other systems
    - 1.2.4 future and potential in the telecommunication industry
    - 1.2.5 cost-benefit
  - 1.3 describe how common standards allow telecommunication systems to merge and connect
  - 1.4 identify the types of transmission protocols and common languages used in telecommunication systems and describe how and when they are used
- 2. describe how telecommunication systems are evolving, merging and connecting**
  - 2.1 compare and contrast key elements of an effective computer infrastructure in two or more applications including:
    - 2.1.1 transmission systems
    - 2.1.2 information and interactive applications/services
    - 2.1.3 software applications
    - 2.1.4 standards and protocols
    - 2.1.5 people and expertise
  - 2.2 identify and analyze key challenges facing computer-mediated communications; e.g., regulation versus open systems, equity of access
  - 2.3 describe cost implications to establish and maintain a telecommunication system
- 3. design a telecommunication solution that improves communication for an individual, a business or society**
  - 3.1 identify key social challenges in managing telecommunication technologies in our society including:
    - 3.1.1 regulation versus open systems
    - 3.1.2 personal privacy
    - 3.1.3 ease and equity of access; e.g., usability, costs
    - 3.1.4 legal/ethical considerations

- 3.1.5 courtesies/protocols
  - 3.1.6 viruses
- 3.2 describe economic challenges and benefits of a growing telecommunication industry
- 4. demonstrate established laboratory procedures and safe work practices**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

**COURSE NET3910: NET PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify a project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals



**COURSE NET3920: NET PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:**

The teacher/student will:

**1. identify the two or more CTS courses being linked to this course**

- 1.1 justify the connection
- 1.2 identify key outcomes

**2. propose, manage and assess a project and/or performance**

- 2.1 identify project and/or performance by:
  - 2.1.1 preparing a plan
  - 2.1.2 clarifying the purposes
  - 2.1.3 defining the deliverables
  - 2.1.4 specifying time lines
  - 2.1.5 explaining terminology, tools and processes
  - 2.1.6 defining resources; e.g., materials, costs, staffing
- 2.2 identify and comply with all related health and safety standards
- 2.3 define assessment standards (indicators for success)
- 2.4 present the proposal and obtain necessary approvals

The student will:

**3. meet goals as defined within the plan**

- 3.1 complete the project and/or performance as outlined
- 3.2 monitor the project and/or performance and make necessary adjustments
- 3.3 present the project and/or performance indicating the:
  - 3.3.1 outcomes attained
  - 3.3.2 relationship of outcomes to goals originally set
- 3.4 evaluate the project and/or performance indicating the:
  - 3.4.1 processes and strategies used
  - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

# TRADES, MANUFACTURING & TRANSPORTATION (TMT)

The focus of the TMT cluster is for students to develop and apply important knowledge, skills and attitudes relative to the manufacture and assembly of products from individual components and the processing of raw materials into products.

## Occupational Areas in the TMT Cluster

- Construction
- Electro-Technologies
- Fabrication
- Logistics
- Mechanics



## **COURSE CON1010: CONSTRUCTION TOOLS & MATERIALS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop basic hand tool and production skills to transform common building materials safely into useful products.

**Parameters:** Access to a materials work centre, complete with basic hand tools.

**Outcomes:** The student will:

**1. create a health and safety plan with special emphasis on conditions and factors related to the specific pathway or series of courses**

1.1 research and identify the following eight common elements of a health and safety management system:

1.1.1 management, leadership and organizational commitment including policies, guidelines and responsibilities

1.1.2 hazard identification and assessment

1.1.3 hazard control

1.1.4 worker competency and training including technical competence, safe work practices and procedures, personal protective equipment

1.1.5 work site inspection

1.1.6 incident investigation

1.1.7 emergency response

1.1.8 management system administration including evaluation, records and statistics, maintenance of system

1.2 explain each of the elements reflecting on occupational health and safety implications

1.3 define health and safety elements relevant to the world-of-work

1.4 present a health and safety plan clarifying its relevance to the work world and society in general

**2. research common processes and methods of hazard identification, assessment and control specific to the pathway or series of courses**

2.1 research and identify common job site hazard identification processes

2.2 research and identify common methods for assessment and control of hazards

2.3 explain and demonstrate appropriate health and safety effective practices

2.4 demonstrate a proactive personal commitment toward improvement of workplace health and safety including concern for others and following instructions, rules and guidelines

**3. identify and describe the safe use of basic hand tools**

3.1 identify and describe basic hand tools that are used to measure, mark, hold, cut, form, fasten and finish materials

**4. identify and compare the properties of common materials used in construction activities**

4.1 identify and compare the properties of a variety of common materials used to make artifacts and structures

4.2 identify common shapes, sizes and forms of construction materials

4.3 describe appropriate methods to handle, recycle, store and dispose of materials



**5. apply construction processes and skills to produce a product**

- 5.1 outline the typical phases in a production system; e.g., planning, constructing, assembling, finishing or evaluating
- 5.2 select or modify a plan for a simple product that will meet a defined need
- 5.3 identify and select the appropriate tools, materials and processes required to make the product
- 5.4 list the steps that are required to make a product in a safe and logical order
- 5.5 develop basic construction skills by building, assembling and finishing a variety of products
- 5.6 identify and demonstrate the appropriate use of personal protective equipment
- 5.7 identify steps to be taken in the event of an accident
- 5.8 describe ways to improve product quality and productivity

**6. demonstrate basic competencies**

- 6.1 demonstrate fundamental skills to:
  - 6.1.1 communicate
  - 6.1.2 manage information
  - 6.1.3 use numbers
  - 6.1.4 think and solve problems
- 6.2 demonstrate personal management skills to:
  - 6.2.1 demonstrate positive attitudes and behaviours
  - 6.2.2 be responsible
  - 6.2.3 be adaptable
  - 6.2.4 learn continuously
  - 6.2.5 work safely
- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks

**7. make personal connections to the cluster content and processes to inform possible pathway choices**

- 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 7.2 create a connection between a personal inventory and occupational choices

## **COURSE CON1070: BUILDING CONSTRUCTION**

**Level:** Introductory

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students examine common building systems and develop basic skills related to building a simple model or full-size system/structure.

**Parameters:** Access to a materials work centre, complete with basic hand tools.

**Outcomes:** The student will:

### **1. identify and describe the main systems found in a residential structure**

- 1.1 identify the materials that can be used to construct the:
  - 1.1.1 foundation or support system
  - 1.1.2 floor and wall system
  - 1.1.3 roof system
  - 1.1.4 exterior/interior finishes
- 1.2 describe how information is gathered and used in the construction industry; e.g., site information, engineering specifications or building codes
- 1.3 describe systems that are found in most buildings; e.g., structural, electrical, heating, ventilating and air conditioning, or water and waste removal
- 1.4 describe the methods that are used to communicate ideas and information relative to the design and construction of a project; e.g., blueprints or architectural drawings
- 1.5 identify the factors that affect the design of a structure including:
  - 1.5.1 safety
  - 1.5.2 function
  - 1.5.3 aesthetics
- 1.6 identify design techniques that are used to counteract static and dynamic forces on a structure; e.g., braces, trusses or ties
- 1.7 describe the landscaping features that will be used to complete a project

### **2. list and describe the basic materials and hand tools used in building construction**

- 2.1 describe how structural materials and construction tools are safely used on the work site

### **3. apply basic construction techniques to build a simple scale model or full-size structure/system**

- 3.1 list and describe the major types of construction projects; e.g., residential, industrial, commercial or civil
- 3.2 select or modify a set of working drawings to build a simple building structure or system
- 3.3 select or identify an appropriate location
- 3.4 use the appropriate tools, materials and processes to:
  - 3.4.1 construct a simple shelter, scale model or system
- 3.5 use the appropriate personal protective clothing and equipment

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices.

## **COURSE CON1120: PRODUCT MANAGEMENT**

**Level:** Introductory

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop basic shop drawing and estimating skills and apply them to build a product.

**Parameters:** Access to a materials work centre, complete with basic drawing and construction tools, and to instruction from an individual with specialized training in the use of power tools.

**Outcomes:** The student will:

**1. identify and describe the parts of a technological system**

1.1 describe the following components of a technological system:

- 1.1.1 input
- 1.1.2 output
- 1.1.3 process
- 1.1.4 feedback

**2. apply basic drawing skills to prepare a shop drawing**

- 2.1 list and describe common types of shop drawings
- 2.2 identify manual techniques and/or computer processes to create a drawing
- 2.3 create or modify a suitable product design
- 2.4 prepare a working drawing of a product with multiple parts

**3. prepare a project timeline, cost estimate and work schedule**

- 3.1 identify the method of costing materials using lineal, area and volume measurements
- 3.2 describe methods that are used to estimate the amount of time required to complete a project
- 3.3 analyze the drawing to create a:
  - 3.3.1 materials list
  - 3.3.2 cost estimate
  - 3.3.3 work schedule

**4. apply the use of a technological system to construct a simple product with multiple parts**

- 4.1 identify a variety of products and describe the types of materials, joints and fastening and finishing systems that are used, and explain how these details are shown on a drawing
- 4.2 for a product with multiple parts, use the appropriate tools, materials and processes to:
  - 4.2.1 lay out, cut, surface and size materials
  - 4.2.2 assemble and fasten parts
  - 4.2.3 prepare for finishing
  - 4.2.4 apply a simple finish
- 4.3 match the manufacturer's recommendations and Workplace Hazardous Materials Information System (WHMIS) regulations when using hazardous finishing materials
- 4.4 use personal protective equipment
- 4.5 identify methods to improve quality and productivity through:
  - 4.5.1 accurate measurements
  - 4.5.2 choice of correct tools
  - 4.5.3 use of tools that are in good condition

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

**6. make personal connections to the cluster content and processes to inform possible pathway choices**

- 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 6.2 create a connection between a personal inventory and occupational choices



## **COURSE CON1130: SOLID STOCK CONSTRUCTION**

**Level:** Introductory

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop basic hand and power tool skills to build a product made from solid wood.

**Parameters:** Access to a materials work centre, complete with basic hand and power tools, and to instruction from an individual with specialized training in the use of power tools.

**Supporting Course:** CON1120: Product Management

**Outcomes:** The student will:

**1. identify and describe the physical characteristics of a variety of hard and soft woods**

- 1.1 describe the physical characteristics of a variety of hard and soft woods
- 1.2 list and describe common wood faults
- 1.3 identify and describe correct methods of handling and storing lumber

**2. apply basic drawing and transfer skills to prepare a pattern or template**

- 2.1 identify common shapes and lines used in product design
- 2.2 select or modify a plan for a free-standing or wall-mounted product that is made from solid or built-up stock
- 2.3 produce a pattern or template from a scale drawing
- 2.4 develop a cutting list and event sequence

**3. construct a wooden product, using basic joinery techniques**

- 3.1 describe common methods of making a built-up surface using edge joints and reinforce with dowels, biscuits or splines
- 3.2 describe the process of squaring solid stock
- 3.3 describe the safe operation of hand and power equipment that is used to:
  - 3.3.1 joint and surface solid stock
  - 3.3.2 cut and shape irregular surfaces
  - 3.3.3 scrape and sand flat and irregular surfaces
- 3.4 use the appropriate tools, materials and processes to:
  - 3.4.1 cut and surface stock
  - 3.4.2 joint, glue and clamp
  - 3.4.3 measure and lay out parts
  - 3.4.4 cut and shape parts
  - 3.4.5 assemble and fasten
  - 3.4.6 prepare for finishing
  - 3.4.7 apply a finish

- 3.5 complete a visual inspection of the product to see that the joints are tight fitting and surfaces are free of marks, gouges, burns and voids

#### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

#### **5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE CON1140: TURNING OPERATIONS**

**Level:** Introductory

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students use wood turning equipment and techniques to create a faceplate and spindle turning made from solid and/or built-up stock.

**Parameters:** Access to a materials work centre, complete with basic hand and power tools, and to instruction from an individual with specialized training in the use of power tools.

**Supporting Course:** CON1120: Product Management

**Outcomes:** The student will:

- 1. safely operate a power wood lathe**
  - 1.1 identify the common lathe chisels and accessories associated with wood turning
  - 1.2 describe recommended tools and accessories for faceplate and spindle turning
  - 1.3 identify and describe accepted work piece mounting and supporting techniques
  - 1.4 describe the turning characteristics of a number of common woods
  - 1.5 identify finishes and finishing procedures suitable for common turned products
  - 1.6 identify and demonstrate the safe use and operation of the wood lathe
- 2. apply drawing and transfer skills to prepare a full-size pattern or template**
  - 2.1 select, modify or design a faceplate and/or spindle-type product that incorporates three or more different types of cuts
  - 2.2 create a full-size pattern or template
- 3. produce a faceplate and spindle turning, using solid or built-up stock**
  - 3.1 prepare a material list and cost estimate
  - 3.2 show a sequence of operations that facilitates the safe and efficient use of materials, tools and equipment
  - 3.3 calculate the appropriate turning speeds using tables
  - 3.4 demonstrate the appropriate skills to:
    - 3.4.1 prepare stock for turning
    - 3.4.2 lay out and size a rough turning
    - 3.4.3 rough cut and finish cut according to a predetermined pattern/template or free-forming principles
    - 3.4.4 sand and apply the recommended finish
    - 3.4.5 remove and assemble finished product
  - 3.5 complete a visual inspection of a product to determine if the structure is sound and if surfaces are free of scratches, gouges, burns and voids
  - 3.6 demonstrate efficient methods to improve quality and productivity
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE CON1160: MANUFACTURED MATERIALS**

**Level:** Introductory

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students select and use the appropriate materials and tools to build a product or structure from a wood composite or another manufactured material.

**Parameters:** Access to a materials work centre, complete with basic hand and power tools, and to instruction from an individual with specialized training in the use of power tools.

**Supporting Course:** CON1120: Product Management

**Outcomes:** The student will:

- 1. identify and describe the characteristics of common manufactured materials**
  - 1.1 identify the various types of manufactured materials; e.g., plywood, hardboard, particle board
  - 1.2 describe how a common manufactured material is made
  - 1.3 explain the advantages of using manufactured materials
- 2. demonstrate the safe use of a given hand and power tool**
  - 2.1 describe the safe operation of hand and power tools to make dado, rabbet and mitre joints in plywood and other manufactured materials
  - 2.2 use the appropriate tools, materials and processes to:
    - 2.2.1 measure and lay out the components
    - 2.2.2 cut to size and surface all edges
    - 2.2.3 edge bond all exposed surfaces, as required
    - 2.2.4 machine the appropriate joints
    - 2.2.5 assemble and clamp
    - 2.2.6 attach the appropriate hardware
    - 2.2.7 prepare for finishing
    - 2.2.8 apply a suitable finish
- 3. create a product from a manufactured material, using basic joinery techniques**
  - 3.1 describe typical methods of constructing a product from a manufactured material; e.g., types of joints, fastening systems, edge treatments
  - 3.2 identify the factors that determine the quality of a wood joint
  - 3.3 select or modify a plan for a project that incorporates basic joinery and edge treatment techniques
  - 3.4 create a bill of materials, cutting list and event sequence
  - 3.5 identify and describe common methods used to finish plywood and other wood substitutes
  - 3.6 conduct a visual inspection of components to see that the joints are tight fitting, surfaces are free of marks and edges are covered and finished appropriately
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems



- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE CON1180: MOULD MAKING & CASTING**

**Level:** Introductory

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students apply knowledge of casting and moulding materials and processes to prepare a mould and produce a casting.

**Parameters:** Access to a materials work centre, complete with moulding and casting equipment.

**Outcomes:** The student will:

### **1. list and describe common materials and processes used in casting/moulding**

- 1.1 identify and describe materials used to cast/mould including:
  - 1.1.1 clay slip
  - 1.1.2 concrete
  - 1.1.3 polystyrene beads
  - 1.1.4 plastisol
  - 1.1.5 model metal
- 1.2 describe common processes of casting/moulding clay, concrete and plastic
- 1.3 differentiate between hardening by cooling, curing and drying
- 1.4 describe the kinds of materials and methods that are used to make patterns and moulds
- 1.5 describe factors that affect the quality of a cast or moulded product

### **2. apply principles of pattern making to create a simple mould**

- 2.1 identify and describe the health and safety hazards associated with heating plastic and firing ceramic products
- 2.2 design or prepare a mould for a ceramic or plastic product

### **3. cast and finish a product, using the appropriate skills, materials and processes**

- 3.1 calculate the quantities of materials required to make a casting
- 3.2 prepare a detailed step-by-step set of procedures to make a cast or moulded product
- 3.3 locate the necessary personal protective clothing and equipment for a specific casting/moulding process
- 3.4 describe a plan of action in the event of an accident
- 3.5 use the appropriate tools, materials and processes to:
  - 3.5.1 make or prepare a mould
  - 3.5.2 measure and mix quantities of materials
  - 3.5.3 pour, cure and finish a cast and/or moulded product
- 3.6 use the appropriate personal protective equipment

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE CON1910: CON PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices



## **COURSE CON2010: SITE PREPARATION**

**Level:** Intermediate

**Prerequisite:** CON1070: Building Construction

**Description:** Students develop the knowledge and skills to acquire a building permit and to locate and prepare a site for excavation and foundation work.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.

**Outcomes:** The student will:

- 1. identify and describe a typical building site layout and excavation processes**
  - 1.1 describe a typical method of establishing lot and building lines as well as grade levels
  - 1.2 explain the use of a plumb bob, builder's level and transit and string line
  - 1.3 use a site plan and elevation drawings to determine the amount of soil to be excavated
- 2. complete an application for a building permit**
  - 2.1 explain the purpose of local, provincial and national building regulations
  - 2.2 identify local zoning regulations that limit the type, size and location of new buildings
  - 2.3 identify the parameters for selecting a building site
  - 2.4 identify the information that is needed to complete an application for a building permit
- 3. apply site preparation skills to assist in the location of building site lines and features**
  - 3.1 locate and mark all underground and overhead services
  - 3.2 identify soil conditions that may require shoring
  - 3.3 use an approved method to:
    - 3.3.1 position batterboards
    - 3.3.2 locate lot and building lines
    - 3.3.3 excavate
    - 3.3.4 establish locations and elevations for wall and pier footings
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CON2020: CONCRETE FORMING**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop knowledge and skills related to the preparation and construction of a concrete foundation.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.

**Supporting Courses:** CON1070: Building Construction  
CON2010: Site Preparation

**Outcomes:** The student will:

### **1. list and describe factors that affect footing and wall design**

- 1.1 describe how soils are tested for:
  - 1.1.1 resistance to penetration
  - 1.1.2 shear resistance
  - 1.1.3 moisture content
- 1.2 explain how soil, water and frost conditions affect the design and construction of a foundation as well as excavation and safety procedures

### **2. identify and describe common forming materials and processes**

- 2.1 explain the purpose of a footing
- 2.2 describe one or more common techniques to form footings, walls and piers
- 2.3 describe methods of reinforcing a footing and wall section
- 2.4 identify the parts of a typical concrete wall form
- 2.5 explain the difference between box-sill and cast-in-place construction
- 2.6 identify release agents and coatings used on forms
- 2.7 describe types of cement and concrete mixers used in footing and wall systems
- 2.8 describe factors that determine the size and strength of a footing and wall components

### **3. apply concrete forming skills to assist in forming and placing a concrete foundation**

- 3.1 prepare a detailed list of materials and supplies to form a footing and wall
- 3.2 calculate the volume of concrete required for a footing and wall component
- 3.3 use the appropriate tools and materials to:
  - 3.3.1 construct a set of forms for a rectangular footing and wall section
  - 3.3.2 square level, align and brace
  - 3.3.3 place, consolidate and finish a concrete footing and wall section
  - 3.3.4 make provisions to attach a sill plate, if necessary
  - 3.3.5 seal walls below ground level and install weeping tile
  - 3.3.6 backfill, taking into account lateral pressure

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2030: ALTERNATIVE FOUNDATIONS**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop basic knowledge and skills related to the design and construction of an alternative foundation system.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.

**Supporting Courses:** CON1070: Building Construction  
CON2020: Concrete Forming

**Outcomes:** The student will:

**1. identify and describe the components of an alternative foundation system**

- 1.1 describe alternative foundation systems and materials including:
  - 1.1.1 concrete masonry block
  - 1.1.2 preserved wood
  - 1.1.3 foam form
- 1.2 label and describe the parts of a typical preserved wood, masonry block and/or foam form foundation
- 1.3 list and describe the factors that determine the design and construction of a footing and wall section for one or more alternative systems
- 1.4 describe levelling and plumbing techniques that are used with a particular foundation system
- 1.5 describe recommended methods that are used to control drainage and damp proof an alternative foundation system
- 1.6 describe the flooring options that can be used with an alternative foundation system

**2. identify the health hazards and precautions related to the use of engineered materials**

- 2.1 identify local building codes that pertain to the design and construction of alternative foundation systems
- 2.2 identify suitable personal protective equipment and recommended procedures related to the use of alternative materials
- 2.3 describe suitable methods used to dispose of scrap materials

**3. apply construction skills to assist in the design/construction of an alternative foundation system**

- 3.1 prepare a sketch of an alternative foundation that identifies construction details, size and spacing of components, as well as sealing, drainage and damp proofing features
- 3.2 use the appropriate tools, materials and processes to:
  - 3.2.1 level the footings and create the necessary drainage system
  - 3.2.2 lay out and assemble the wall section
  - 3.2.3 seal joints and apply a vapour seal/damp proofing
  - 3.2.4 backfill without damaging the moisture barrier

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems



- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2035: FLOOR FRAMING SYSTEMS**

<b>Level:</b>	Intermediate
<b>Prerequisite:</b>	CON1010: Construction Tools & Materials
<b>Description:</b>	Students develop basic framing knowledge and skills associated with the construction of a floor and wall system.
<b>Parameters:</b>	Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.
<b>Supporting Course:</b>	CON1070: Building Construction
<b>Outcomes:</b>	The student will:

### **1. identify and describe the parts of a floor framing system**

- 1.1 describe common wood defects associated with natural growth and milling operations
- 1.2 compare the span limitations of different species and grades of lumber and manufactured components
- 1.3 identify common types of subflooring materials
- 1.4 identify the adhesives and fasteners used in conjunction with floor framing
- 1.5 identify the layout and installation procedure of a typical floor framing system
- 1.6 compare platform framing to post and beam construction
- 1.7 describe the consequences of a floor system that has not been sized or constructed properly

### **2. read and interpret the appropriate drawings and specifications to create a floor framing and sheathing estimate**

- 2.1 use a frame structure drawing to determine the location, type and sizes of joists and beams, as well as subflooring requirements
- 2.2 prepare a quantity takeoff for a floor

### **3. apply framing skills to assist in the layout and construction of floor components**

- 3.1 identify and describe the proper and safe use of portable electric and air-activated tools
- 3.2 demonstrate proper methods of lifting materials and components
- 3.3 use proper personal protective equipment
- 3.4 cover openings and build railings, where needed
- 3.5 use the appropriate hand tools and portable equipment to:
  - 3.5.1 lay out components
  - 3.5.2 cut and assemble floor joists
  - 3.5.3 square floor
  - 3.5.4 install subflooring

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely

- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2045: WALL FRAMING SYSTEMS**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop basic framing knowledge and skills associated with the construction of a wall system.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

### **1. identify and describe the parts of a wall framing system**

- 1.1 describe common wood defects associated with natural growth and milling operations
- 1.2 compare the span limitations of different species and grades of lumber and manufactured components
- 1.3 identify common types of sheathing materials
- 1.4 identify the adhesives and fasteners used in conjunction with wall framing
- 1.5 identify the parts and purpose of a typical wall framing system
- 1.6 compare platform framing to post and beam construction
- 1.7 describe the components of an engineered wall system

### **2. read and interpret the appropriate drawings and specifications to create a wall framing and sheathing estimate**

- 2.1 use a frame structure drawing to determine the location, type and sizes of sills and headers, as well as sheathing requirements
- 2.2 use a wall frame elevation to determine the size and locations of studs, headers and rough opening sizes
- 2.3 prepare a quantity takeoff for a wall section

### **3. apply framing skills to assist in the layout and construction of wall components**

- 3.1 identify and describe the proper use of portable electric and air-activated tools
- 3.2 demonstrate proper methods of lifting materials and components
- 3.3 use proper personal protective equipment
- 3.4 cover openings and build railings, where needed
- 3.5 use the appropriate hand tools and portable equipment to:
  - 3.5.1 lay out components
  - 3.5.2 cut materials for wall sections
  - 3.5.3 lay out and assemble a wall section
  - 3.5.4 square floor and wall components
  - 3.5.5 install sheathing
  - 3.5.6 erect, plumb and brace wall sections

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CON2050: ROOF STRUCTURES 1 (FRAMING & FINISHING)**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop basic knowledge and skills associated with framing and finishing a simple roof system.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

**1. identify and describe the different styles and parts of a roof system**

- 1.1 list and describe the common styles of roofs
- 1.2 define roof terms such as span, run, rise, slope and overhang
- 1.3 describe the parts of a common rafter
- 1.4 describe the parts of a typical roof truss
- 1.5 describe the advantages of using roof trusses versus standard common rafters
- 1.6 list and describe the parts of a boxed cornice
- 1.7 identify sheathing grades and types, and joint and nailing patterns
- 1.8 list and describe the types of roof finishes

**2. read and interpret the appropriate drawings and specifications to create a roof framing and finishing estimate**

- 2.1 make a roof sketch indicating the location of roof trusses, lookout rafters, bridging, fascia headers, boxed cornices and sheathing patterns
- 2.2 prepare a materials list specifying:
  - 2.2.1 the size, slope and number of roof trusses or common rafters
  - 2.2.2 thickness and quantities of sheathing
  - 2.2.3 quantities of H-clips and metal anchors
  - 2.2.4 style, colour, weight and quantities of asphalt shingles

**3. apply roofing skills to assist in the framing and finishing of a roof structure**

- 3.1 check condition of ladders before using and observe safe angle ratios
- 3.2 use proper foot and head protection
- 3.3 identify hazards associated with wet or frosty conditions on sloped surfaces
- 3.4 identify safety devices that are used in conjunction with roof construction
- 3.5 use the appropriate tools and equipment to:
  - 3.5.1 locate, fasten, square and plumb roof trusses
  - 3.5.2 cut and install common rafters
- 3.6 install lookouts, fascia and braces
- 3.7 apply sheathing and shingling

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2060: EXTERIOR FINISHING (DOOR, WINDOW & SIDING)**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students apply and develop basic knowledge of door, window and siding systems and of installation skills and procedures.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

- 1. identify and describe common types of exterior doors, windows and siding materials**
  - 1.1 list and describe common types of exterior doors and windows
  - 1.2 identify methods of sizing windows and exterior doors
  - 1.3 describe the procedures used to install an exterior door and a window
  - 1.4 list and describe the components used in conjunction with the installation of vinyl and aluminum siding
  - 1.5 describe the purpose and use of building papers and other housewrap materials
- 2. read and interpret the appropriate drawings and specifications to create a door and window schedule and siding estimate**
  - 2.1 use elevation drawings and specifications to develop a door and window schedule
  - 2.2 use an elevation drawing to identify the types of siding and cornice materials and estimated amounts
- 3. apply finishing skills to install a prehung door, a window unit and siding materials**
  - 3.1 use the appropriate tools and processes to:
    - 3.1.1 level, plumb, seal and fasten a prefabricated door and a window unit
    - 3.1.2 install exterior finishes
    - 3.1.3 check and secure all scaffolding
    - 3.1.4 observe proper handling and lifting procedures
    - 3.1.5 use appropriate eye and ear protection
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely

4.3 demonstrate teamwork skills to:

4.3.1 work with others

4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2070: ELECTRICAL SYSTEMS**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students apply electrical principles and develop an understanding of residential electrical code requirements and installation procedures.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in electrical work.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

- 1. list and describe the electrical systems and components associated with residential wiring**
  - 1.1 identify the principal hazards associated with electrical work; e.g., shocks, burns, fire, falls
  - 1.2 outline methods that are commonly used to prevent contact with a live electric circuit
  - 1.3 identify the nonconducting extinguishing agents that can be used with electrical fires
  - 1.4 describe and provide examples of:
    - 1.4.1 alternating and direct current
    - 1.4.2 series and parallel circuits
  - 1.5 define the terms and explain the relationships between voltage, amperage and resistance in a typical circuit
  - 1.6 identify the common types of electrical systems found in a modern home such as lighting, utility, heating, communication and alarm systems
  - 1.7 describe the symbols that are used to indicate a wall plug, light fixture, range, dryer plug, etc., on an electrical drawing
  - 1.8 identify the code requirements for installing outlets in a kitchen, bathroom, living room and bedroom
  - 1.9 list and describe the types of conductors and connection devices that are used in conventional construction
  - 1.10 identify design and framing requirements when installing electrical fixtures and wires
- 2. apply wiring principles and code requirements to create a wiring diagram**
  - 2.1 make a wiring diagram for a typical residential wiring project
  - 2.2 prepare a list of materials for a wiring project
  - 2.3 complete an application for a wiring permit
- 3. apply wiring skills to assist in the installation of a residential wiring system**
  - 3.1 use the appropriate tools and materials to frame and install a typical residential wiring circuit including:
    - 3.1.1 general purpose and split receptacle
    - 3.1.2 single-pole and three-way switch
    - 3.1.3 ceiling fixture
    - 3.1.4 outside outlet
    - 3.1.5 service panel
  - 3.2 test a circuit for power, grounding and continuity



**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2080: PLUMBING SYSTEMS**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop basic knowledge and skills to fabricate and make repairs to residential drainage, waste and vent (DWV) and water supply systems.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in plumbing.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

**1. identify and describe the parts of a residential plumbing system**

- 1.1 identify and describe the piping systems in a conventional residence such as water supply, vent, drainage and gas supply
- 1.2 examine the principles related to proper sizing, venting, pressures and drainage angles
- 1.3 investigate and compare the use of iron, copper, brass and plastic components
- 1.4 identify the symbols that are used to depict common fixtures and fittings
- 1.5 identify the code requirements for installing a residential plumbing system
- 1.6 identify appropriate methods of cutting iron, copper, steel and plastic pipe

**2. create a drawing of a water supply system and a DWV system for a typical plumbing fixture**

- 2.1 sketch a typical water supply system and a DWV system for a typical household fixture

**3. apply plumbing skills to assist in the installation of a water supply system and a DWV system**

- 3.1 describe and demonstrate approved methods of joining pipe using solder, cohesives, mechanical joints and threaded fasteners
- 3.2 determine when to use face-to-face, centre-to-centre and shoulder-to-shoulder measurements
- 3.3 use a plumbing layout drawing to create a detailed materials list and cost estimate
- 3.4 locate and use the appropriate fire extinguisher for a given type of fire
- 3.5 describe the health hazards associated with the use of solder and plastic adhesives
- 3.6 use the appropriate tools, materials and techniques to:
  - 3.6.1 rough in a water supply system and a DWV system
  - 3.6.2 pressure test a supply system
  - 3.6.3 install a fixture and connect supply and drainage lines

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely

4.3 demonstrate teamwork skills to:

4.3.1 work with others

4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2090: CLIMATE CONTROL SYSTEMS**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students investigate common heating, ventilating and air conditioning (HVAC) systems and principles and participate in the installation or maintenance of one of these systems.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in sheet metal and climate control installation/service.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

- 1. list and describe the major components of a typical HVAC system**
  - 1.1 research the methods heat is transferred; e.g., convection, radiation, gravity
  - 1.2 identify the parts of a typical HVAC system
  - 1.3 compare hot water with forced air heating
  - 1.4 identify and describe the types of warm/cold air distribution systems; e.g., perimeter loop, radial, trunk, branch
  - 1.5 explain how heating systems are sized, how the number of outlets is calculated and how locations are determined
  - 1.6 examine a typical heating system and determine how room temperatures are regulated
  - 1.7 explain the effects on air quality when there is a lack of ventilation
  - 1.8 describe the cost effectiveness of heating with various fuels
- 2. prepare a preventive maintenance schedule for an HVAC system**
  - 2.1 identify the service routines that should be followed for a heating and cooling system
  - 2.2 prepare a service schedule for the HVAC component
- 3. service or install an HVAC system**
  - 3.1 prepare a layout for a part of an HVAC system
  - 3.2 assist in the installation of an HVAC system
  - 3.3 service a component of an HVAC system
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely

- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CON2100: AGRI-STRUCTURES**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students apply construction principles and skills and use pre-engineered designs to build a structure to be used for agricultural purposes.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry or metal work.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

- 1. identify the major issues that must be addressed when designing an agri-structure**
  - 1.1 describe the types of materials and structures used in agriculture businesses
  - 1.2 list the factors that affect the choice of materials and design of agri-structure including:
    - 1.2.1 human and environmental safety standards
    - 1.2.2 animal comfort and safety
    - 1.2.3 crop protection
    - 1.2.4 conditions of use
    - 1.2.5 ease of construction and maintenance
    - 1.2.6 material cost
- 2. read and interpret the appropriate drawings and specifications to create a material and cost estimate**
  - 2.1 produce/select an agri-structure design that:
    - 2.1.1 uses two or more types of structural materials
    - 2.1.2 applies basic construction principles and processes
    - 2.1.3 meets industry standards
  - 2.2 estimate the cost of materials and prepare a work schedule
- 3. construct a structure for use in agriculture**
  - 3.1 use the appropriate tools, materials and processes to construct and finish a structure
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2120: MULTIPLE MATERIALS**

**Level:** Intermediate

**Prerequisite:** CON1120: Product Management

**Description:** Students develop a product that incorporates two or more types of material in its construction.

**Parameters:** Access to a fully equipped materials facility and to instruction from an individual with specialized training in the use of common materials and tools.

**Outcomes:** The student will:

- 1. identify advantages of using different materials in a product**
  - 1.1 describe the properties of common production materials
  - 1.2 research and state the reasons for using combinations of wood, metal, plastic, ceramic and other materials
  - 1.3 identify indicators of a quality product
- 2. apply knowledge of structural materials, planning and construction techniques to produce a product from different materials**
  - 2.1 select, modify or design a product that incorporates two or more materials in its construction
  - 2.2 identify the methods by which different materials are fastened together
  - 2.3 identify health and safety concerns associated with a given material
  - 2.4 prepare a detailed sequence of operations that facilitates the safe and efficient use of materials and tools
  - 2.5 create a cutting list and cost estimate
  - 2.6 use the appropriate tools and supplies to safely:
    - 2.6.1 measure and lay out components
    - 2.6.2 cut and remove waste from materials
    - 2.6.3 form components, where required
    - 2.6.4 fasten or bond components
    - 2.6.5 align and clamp components
    - 2.6.6 prepare for finishing
  - 2.7 identify the types of finishes that are compatible with wood, metal, plastic, ceramic and other surfaces
  - 2.8 select compatible finishes
  - 2.9 finish the product using appropriate finishes
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems

- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. identify possible life roles related to the skills and content of this cluster**
  - 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 4.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2130: FURNITURE MAKING 1 (BOX CONSTRUCTION)**

**Level:** Intermediate

**Prerequisite:** CON1120: Product Management

**Description:** Students develop basic joinery skills and knowledge related to case construction by producing a box-type piece of furniture.

**Parameters:** Access to a woodworking or materials facility and to instruction from an individual with formal, specialized training in cabinetry/carpentry.

**Outcomes:** The student will:

- 1. identify and describe the design features and processes used to construct a box-type furniture product**
  - 1.1 research typical design and joinery techniques that are commonly used in box construction
  - 1.2 identify construction features including:
    - 1.2.1 door
    - 1.2.2 drawer
    - 1.2.3 plinth
  - 1.3 describe the safe set-up and operation of hand and/or power tools to make a series of joints; e.g., reinforced butt, reinforced mitre, rabbet, dado, finger
  - 1.4 identify and describe the use of common fasteners and clamping procedures used with a specific joint
  - 1.5 identify common fittings and construction techniques used to make the following doors:
    - 1.5.1 flush
    - 1.5.2 sliding
    - 1.5.3 tambour
    - 1.5.4 fall-flap
- 2. apply basic furniture making skills to plan and construct a piece of furniture based on box construction techniques**
  - 2.1 select a box-type product that requires the use of:
    - 2.1.1 solid wood and/or composites
    - 2.1.2 a variety of joints and fasteners
    - 2.1.3 typical lay-up and clamping procedures
  - 2.2 prepare a materials list and cost estimate from a working drawing
  - 2.3 prepare a work schedule
  - 2.4 use the appropriate tools, materials and processes to:
    - 2.4.1 measure and lay out stock
    - 2.4.2 cut stock to size
    - 2.4.3 machine surfaces and joints
    - 2.4.4 lay-up, glue, fasten and clamp
    - 2.4.5 fill or plug exposed fasteners
    - 2.4.6 prepare for finishing



**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. identify possible life roles related to the skills and content of this cluster**

- 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 4.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2140: FURNITURE MAKING 2 (FRAME & PANEL)**

**Level:** Intermediate

**Prerequisite:** CON1120: Product Management

**Description:** Students use solid and/or composite materials to build a frame and panel product or component.

**Parameters:** Access to a woodworking or materials facility and to instruction from an individual with formal specialized training in cabinetry/carpentry.

**Outcomes:** The student will:

- 1. identify and describe the design features and processes used to construct a frame and panel product**
  - 1.1 identify the construction details of a typical frame and panel component
  - 1.2 identify the typical wood joints that are used in frame and panel construction
  - 1.3 identify and describe the types of fastening systems that are used in flat frame construction; e.g., reinforcing plates, dowelling, biscuits, splines
  - 1.4 describe the safe set-up and operation of hand and/or power tools used to make a series of joints; e.g., mortise and tenon, dowel, biscuit, lap, mitre, loose tenon
- 2. apply basic furniture making skills to plan and construct a component or piece of furniture based on frame and panel construction techniques**
  - 2.1 select a frame and panel product or component that requires:
    - 2.1.1 interpretation and development of simple working drawings
    - 2.1.2 use of solid woods and/or composites
    - 2.1.3 use of a variety of wood joints, fasteners and other hardware components
    - 2.1.4 typical lay-up and clamping procedures
  - 2.2 show a detailed materials list, cost estimate and work schedule
  - 2.3 use the appropriate tools, machines and processes to:
    - 2.3.1 measure and lay out stock
    - 2.3.2 cut stock to size
    - 2.3.3 machine and fit joints
    - 2.3.4 lay-up, glue, fasten and/or clamp
    - 2.3.5 fill or plug exposed fasteners, where applicable
    - 2.3.6 finish the project
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely

3.3 demonstrate teamwork skills to:

3.3.1 work with others

3.3.2 participate in projects and tasks

**4. identify possible life roles related to the skills and content of this cluster**

4.1 recognize and then analyze the opportunities and barriers in the immediate environment

4.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2150: FINISHING & REFINISHING**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students use knowledge of finishing materials and finishing techniques to apply new and replacement finishes.

**Parameters:** Access to a woodworking or materials facility and to instruction from an individual with specialized training in finishing/refinishing.

**Outcomes:** The student will:

### **1. identify common finishes and finishing/refinishing techniques**

- 1.1 describe techniques that are used to:
  - 1.1.1 identify an existing finish
  - 1.1.2 remove a stain or finish
  - 1.1.3 prepare a surface for refinishing
- 1.2 explain:
  - 1.2.1 bleaching and staining
  - 1.2.2 filling and sealing
  - 1.2.3 creating a distressed finish
- 1.3 identify common finishes and applications
- 1.4 explain the purpose of a filler and sealer
- 1.5 identify the preferred method of applying each of the above finishes; e.g., brush, roller, rag, spray gun
- 1.6 describe what thinners and cleaners are used in conjunction with a given finish

### **2. identify and describe the health hazards and Workplace Hazardous Materials Information System (WHMIS) regulations associated with the products used in finishing/refinishing**

- 2.1 describe the manufacturers' recommendations and WHMIS regulations that apply to the use and storage of a given product
- 2.2 for a refinishing project, identify:
  - 2.2.1 the nature of the existing finish and finish removers
  - 2.2.2 appropriate personal protective equipment
- 2.3 for new and old surfaces, do the following:
  - 2.3.1 select a suitable new or replacement finish
  - 2.3.2 prepare a detailed set of step-by-step finishing procedures
  - 2.3.3 clean the product and the work site

### **3. demonstrate appropriate finishing/refinishing techniques**

- 3.1 use the appropriate tools, materials and techniques to:
  - 3.1.1 remove an existing finish
  - 3.1.2 stain and seal
  - 3.1.3 apply the necessary topcoats
  - 3.1.4 sand, rub and polish, as required
- 3.2 discard all rags and used materials in the appropriate containers
- 3.3 identify ways to improve the quality of a finish

#### **4. demonstrate basic competencies**

##### **4.1 demonstrate fundamental skills to:**

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

##### **4.2 demonstrate personal management skills to:**

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

##### **4.3 demonstrate teamwork skills to:**

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

#### **5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CON2160: CABINETMAKING 1 (WEB & FACE FRAME)**

**Level:** Intermediate

**Prerequisite:** CON1120: Product Management

**Description:** Students apply web and face frame construction techniques and use solid and/or manufactured materials to produce a built-in or modular cabinet.

**Parameters:** Access to a woodworking or materials facility and to instruction from an individual with formal, specialized training in cabinetry/carpentry.

**Outcomes:** The student will:

- 1. identify and describe the design features and processes used to construct a web and face frame product**
  - 1.1 describe the principal methods used to construct a built-in cabinet; e.g., on-site construction, modular system
  - 1.2 identify the parts of a web frame cabinet
  - 1.3 describe the types of joints used in web and face frame construction
  - 1.4 describe safe set-up procedures to make common joints associated with web and face frame construction
  - 1.5 identify the appropriate fastening systems used in economy and premium grade construction
- 2. prepare a detailed materials list and event sequence**
  - 2.1 select or modify a cabinet drawing that uses web and face frame construction
  - 2.2 create a work schedule
  - 2.3 prepare a material cutting list
- 3. build a cabinet, using web and face frame construction techniques**
  - 3.1 use the appropriate tools, materials and processes to:
    - 3.1.1 measure and lay out materials
    - 3.1.2 rough out materials
    - 3.1.3 machine joints and surfaces
    - 3.1.4 assemble, glue, fasten and clamp
    - 3.1.5 fill, scrape and sand
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2170: CABINETMAKING 2 (DOOR & DRAWER)**

**Level:** Intermediate

**Prerequisite:** CON1120: Product Management

**Description:** Students use solid and composite materials to develop skills in building cabinet doors and drawers.

**Parameters:** Access to a woodworking or materials facility and to instruction from an individual with formal, specialized training in cabinetry/carpentry.

**Outcomes:** The student will:

**1. identify and describe common methods of designing and constructing cabinet doors and drawers**

- 1.1 research methods of producing various door treatments including:
  - 1.1.1 raised panel
  - 1.1.2 flush
  - 1.1.3 glass inset
- 1.2 research common door and drawer construction techniques and hardware options
- 1.3 identify the common joints used in door and drawer construction
- 1.4 identify the equipment and describe safe set-up procedures to make a given drawer and door component

**2. apply cabinetmaking skills to plan and construct door/drawer components**

- 2.1 select or modify a cabinet drawing of a drawer and built-up door
- 2.2 select the appropriate door and dresser material
- 2.3 identify an appropriate door guiding system
- 2.4 create a material and procedural list
- 2.5 use the appropriate tools, materials and processes to:
  - 2.5.1 measure and lay out materials
  - 2.5.2 machine surfaces and joints
  - 2.5.3 assemble, glue, fasten and clamp
  - 2.5.4 prepare for finishing

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. identify possible life roles related to the skills and content of this cluster**

- 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 4.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2180: WOOD FORMING**

**Level:** Intermediate

**Prerequisite:** CON1120: Product Management

**Description:** Students apply skills in mould making and wood conditioning to make a formed part or component.

**Parameters:** Access to a woodworking or materials facility and to instruction from an individual with specialized training in woodworking.

**Outcomes:** The student will:

### **1. describe common wood forming techniques**

- 1.1 research and describe typical methods of bending solid stock and laminates including:
  - 1.1.1 soaking in water
  - 1.1.2 steaming
  - 1.1.3 chemical conditioning
- 1.2 describe how to determine the correct spacing for cross and parallel kerfing
- 1.3 describe a system to moisten or steam wood (plasticize) prior to bending
- 1.4 identify woods that lend themselves to cold water or steam bending
- 1.5 identify methods of building up—moulding and clamping veneer stock
- 1.6 select the most appropriate adhesive for a given application and process

### **2. build or obtain the necessary moulds and clamping devices to bend a piece of solid stock or wood laminate**

- 2.1 select or design a formed product or component
- 2.2 calculate the spacing of kerfs for a given radius bend
- 2.3 design a mould for bending or contouring solid stock
- 2.4 obtain suitable stock for bending

### **3. apply wood forming skills and techniques to make a product or component**

- 3.1 use the appropriate tools, materials and processes to:
  - 3.1.1 prepare solid and/or veneer stock for bending
  - 3.1.2 condition, glue and secure
  - 3.1.3 release and finish

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely



- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. **identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2190: MANUFACTURING SYSTEMS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students investigate the nature of manufacturing systems used to produce durable goods.

**Parameters:** Access to in-school and community resources related to manufacturing.

**Supporting Course:** CON1010: Construction Tools & Materials

**Outcomes:** The student will:

**1. describe current production systems used to manufacture durable goods**

- 1.1 describe the development of modern manufacturing from its early roots in the domestic, cottage and factory systems
- 1.2 explain the advantages and disadvantages of a strong manufacturing base in a community
- 1.3 describe the operations of a typical manufacturing system's input requirements, types of processes and outputs, as well as its feedback mechanisms
- 1.4 research a manufacturing company and describe its:
  - 1.4.1 organizational structure
  - 1.4.2 methods of decision making
  - 1.4.3 methods of financing
  - 1.4.4 training practices
  - 1.4.5 research and development
  - 1.4.6 marketing practices
- 1.5 explain how manufacturing is being altered by the global economy and the use of technology

**2. identify the lines of communication and decision making in a typical production system**

- 2.1 show how a typical manufacturer is able to:
  - 2.1.1 increase productivity
  - 2.1.2 provide for choice
  - 2.1.3 reduce skill level requirements
  - 2.1.4 reduce costs per unit produced

**3. explain how the production of durable goods is being altered by the effects of technology and the global economy**

- 3.1 describe how computer-assisted manufacturing, just-in-time and total quality management systems increase:
  - 3.1.1 productivity
  - 3.1.2 quality
  - 3.1.3 profitability
- 3.2 explain why manufacturers are interested in locating near:
  - 3.2.1 skilled population bases
  - 3.2.2 resources
  - 3.2.3 markets
- 3.3 describe the place that organized labour has in manufacturing

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2200: PRODUCT DEVELOPMENT**

**Level:** Intermediate

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students work, individually or as team members, to research, design and build a product suitable for mass production and marketing.

**Parameters:** Access to a materials/construction facility and to instruction from an individual with specialized training in the use of tools and materials.

**Supporting Course:** CON2190: Manufacturing Systems

**Outcomes:** The student will:

- 1. list and describe the steps involved in developing a product for manufacturing**
  - 1.1 describe the life cycle of a typical product from the time of introduction to its decline
  - 1.2 identify reasons for a product being successful; e.g., physical and emotional need, marketing practice, pricing, reputation
  - 1.3 explain how new product ideas are generated
  - 1.4 outline how ideas are developed into new products
  - 1.5 identify the major steps involved in engineering a new product
- 2. apply designing and planning skills to assist in the development of a prototype**
  - 2.1 select or design a product for manufacturing
  - 2.2 create the necessary detail, assembly and schematic drawings
  - 2.3 identify the appropriate materials
  - 2.4 create a prototype product
  - 2.5 test the product
  - 2.6 analyze the design related to:
    - 2.6.1 function
    - 2.6.2 aesthetic appeal
    - 2.6.3 reliability
    - 2.6.4 manufacturability
    - 2.6.5 profitability
  - 2.7 create a market survey
- 3. describe the marketing and manufacturing potential of a product**
  - 3.1 state the importance of product testing and market surveys
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE CON2910: CON PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON2920: CON PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE CON3010: CONCRETE WORK (STRUCTURES & FINISHES)**

**Level:** Advanced

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop essential skills to form, place and finish a concrete project.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in concrete work.

**Supporting Courses:** CON1070: Building Construction  
CON2010: Site Preparation  
CON2020: Concrete Forming

**Outcomes:** The student will:

### **1. identify and describe concrete forming, placing and finishing techniques**

- 1.1 research the effect aggregate, water and cement ratios have on the workability and quality of a concrete mix
- 1.2 list and describe the purpose of different cement types
- 1.3 identify the types of tests and reasons for concrete testing
- 1.4 describe standard forming and reinforcing practices for a project including:
  - 1.4.1 slab on grade
  - 1.4.2 retaining wall
  - 1.4.3 poured stairs
- 1.5 explain the purpose of a control and expansion joint in a concrete structure
- 1.6 identify the purpose and describe the process of:
  - 1.6.1 screeding
  - 1.6.2 puddling
  - 1.6.3 striking off
  - 1.6.4 floating
  - 1.6.5 trowelling
  - 1.6.6 finishing
  - 1.6.7 curing
- 1.7 describe common methods of installing fasteners in concrete before and after the concrete has set up and cured

### **2. use the appropriate tools, materials and processes to form, reinforce, place and finish a concrete structure**

- 2.1 select a concrete project that requires:
  - 2.1.1 forming
  - 2.1.2 reinforcement
  - 2.1.3 consolidation and finishing
- 2.2 produce a list of materials and schedule of events for an on-site project
- 2.3 use the appropriate tools, materials and processes to:
  - 2.3.1 prepare the grade and base
  - 2.3.2 assemble/build and condition a form
  - 2.3.3 install damp proof member
  - 2.3.4 fabricate and install the required reinforcement
  - 2.3.5 mix/order, place and consolidate



- 2.3.6 impart desired finish/colour
  - 2.3.7 provide proper curing conditions
  - 2.3.8 remove forms
- 2.4 describe the safe use and storage of explosive actuated tools and supplies
- 2.5 identify power loads and strengths for a given application
- 2.6 describe prefiring and firing routines
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE CON3020: MASONRY WORK (STRUCTURES & FINISHES)**

**Level:** Advanced

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop basic knowledge and skills related to masonry materials, structures and finishes.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in masonry work.

**Supporting Courses:** CON1070: Building Construction  
CON3010: Concrete Work (Structures & Finishes)

**Outcomes:** The student will:

- 1. identify and describe common types of masonry materials and finishes**
  - 1.1 explain reasons for using a masonry finish over other types of finishes
  - 1.2 analyze a brick veneer wall section and determine the method that is used to:
    - 1.2.1 support the weight of the brick
    - 1.2.2 attach the bricks to the wall surface
    - 1.2.3 prevent moisture build-up between the wall surfaces
  - 1.3 describe the different sizes, textures and grades of bricks
  - 1.4 identify common types of patterns and bonds used in brick structures and veneering
  - 1.5 examine a stucco wall section and identify the:
    - 1.5.1 moisture barrier
    - 1.5.2 corner and stop beads
    - 1.5.3 lath or wire
    - 1.5.4 scratch coat
    - 1.5.5 screeds
    - 1.5.6 finish coat
  - 1.6 identify and describe common stucco finishes and application methods; e.g., smooth, spatter, old English
  - 1.7 identify the differences and similarities between applying a stucco finish to a frame wall and applying parging to a cement or block wall
- 2. read and interpret a working drawing to prepare a cost estimate of a masonry surface**
  - 2.1 estimate the amount of material required to brick veneer a wall section and stucco or parge a surface
- 3. apply masonry skills to assist in the application of a masonry finish or in the construction of a masonry structure**
  - 3.1 list and describe the basic tools that are used in laying brick and concrete blocks
  - 3.2 describe the techniques that are used to:
    - 3.2.1 cut brick
    - 3.2.2 keep courses level and plumb
    - 3.2.3 build a lead
    - 3.2.4 tool joints
  - 3.3 describe the steps that are taken to compensate for extreme weather conditions
  - 3.4 describe the proper mixing proportions to prepare a mortar, stucco and parging mix

- 3.5 use appropriate materials, tools and techniques to:
  - 3.5.1 apply a brick veneer finish or build a brick structure
  - 3.5.2 stucco or parge a wall surface
- 4. **demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. **create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE CON3030: WALL & CEILING FINISHING**

**Level:** Advanced

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop basic knowledge and skills to insulate, install and finish an interior wall/ceiling surface.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.

**Supporting Courses:** CON1070: Building Construction  
CON2035: Floor Framing Systems  
CON2045: Wall Framing Systems

**Outcomes:** The student will:

- 1. describe the procedures related to the installation of insulation and vapour barrier to an exterior wall and ceiling**
  - 1.1 list and describe the types of wall and ceiling insulation and soundproofing materials
  - 1.2 identify the building codes that relate to the installation of insulation, vapour barrier and drywall
- 2. identify and describe the health hazards and safety precautions associated with the use of insulating, drywalling and finishing materials**
- 3. prepare, apply and finish a wall and ceiling surface**
  - 3.1 estimate the amount and type of drywall, insulation, vapour barrier, paint and decorating supplies required to install and finish a wall or ceiling surface
  - 3.2 describe the different types of drywall and conditions of use
  - 3.3 identify and describe the different types of tapes, corner beads, adhesives and fastening devices used with gypsum board
  - 3.4 describe methods of cutting, attaching, taping, filling, sanding and texturing a gypsum board
  - 3.5 check alignment of studs and identify starting points
  - 3.6 mark stud locations on floor and ceiling
  - 3.7 install metal protectors for wiring and plumbing, where necessary
  - 3.8 identify and locate appropriate personal protective equipment, and describe the working conditions and skills required of a drywall mechanic and/or painter/decorator
  - 3.9 use the appropriate tools, materials and processes to:
    - 3.9.1 install insulation, vapour barrier and gypsum board
    - 3.9.2 tape, fill, sand, texture and paint, as required
    - 3.9.3 repair a gypsum board surface
    - 3.9.4 seal, paint and/or apply a wall covering
  - 3.10 describe methods of making repairs to small and large holes in a drywall surface
  - 3.11 identify the materials used to paint and decorate a wall surface
  - 3.12 research common methods used to apply paint to a surface; e.g., brush, roller, spray

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals



## **COURSE CON3040: STAIR CONSTRUCTION**

**Level:** Advanced

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop the knowledge and skills required to build a straight flight of stairs.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with formal, specialized training in carpentry.

**Supporting Courses:** CON1070: Building Construction  
CON2035: Floor Framing Systems  
CON2045: Wall Framing Systems

**Outcomes:** The student will:

**1. identify and describe different stair types, component parts and construction techniques**

- 1.1 identify stair types, materials and methods of construction
- 1.2 research and identify the parts of a stair and railing system
- 1.3 identify a typical layout procedure for a wooden stringer
- 1.4 read and interpret a drawing to determine the:
  - 1.4.1 number of runs and risers
  - 1.4.2 stair width
  - 1.4.3 tread, riser and stringer dimensions
  - 1.4.4 joints
  - 1.4.5 types of materials and fasteners
  - 1.4.6 guard and railing requirements
- 1.5 research methods of attaching and finishing treads and risers; e.g., housed, semi-housed, built-up stringer, notched stringer

**2. interpret building code regulations pertaining to residential stair design**

- 2.1 describe the specific building code regulations regarding headroom, rise, run and railing specifications

**3. design, lay out and construct a straight flight of stairs**

- 3.1 prepare a detailed material list and cost estimate
- 3.2 use the appropriate tools, materials and processes to:
  - 3.2.1 prefabricate a set of stairs
  - 3.2.2 install a suitable railing
  - 3.2.3 check for code conformity

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE CON3050: ROOF STRUCTURES 2 (FRAMING & COVERING)**

**Level:** Advanced

**Prerequisite:** CON2050: Roof Structures 1 (Framing & Finishing)

**Description:** Students develop basic competencies in laying out, cutting and assembling common, hip and valley rafters in relation to specialized structures and coverings.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with formal, specialized training in carpentry.

**Outcomes:** The student will:

- 1. identify and describe the design features of intersecting sloped roofs**
  - 1.1 describe roof types and terminology
  - 1.2 explain the purpose of a roof overhang
  - 1.3 explain how roof dormers and Dutch gables are built
  - 1.4 investigate and describe alternate roof coverings including:
    - 1.4.1 wood shakes
    - 1.4.2 metal shingles
    - 1.4.3 clay tiles
- 2. calculate the length of rafters, using ratio and proportion techniques**
  - 2.1 explain how roof slopes are described and calculated
  - 2.2 from a set of drawings and specifications, calculate the:
    - 2.2.1 roof slope
    - 2.2.2 amount of overhang
    - 2.2.3 length of hip, valley and related jack rafters
  - 2.3 describe three methods of determining the length of a common rafter
- 3. lay out, cut and assemble a set of rafters for a roof assembly**
  - 3.1 sketch a rafter plan for a hip and valley roof system
  - 3.2 describe the types of cuts and features of a:
    - 3.2.1 common rafter
    - 3.2.2 hip rafter and valley rafter
    - 3.2.3 hip rafter and valley jack rafter
  - 3.3 lay out a rafter pattern for a given slope and type of rafter
  - 3.4 prepare and check the condition of required ladders and scaffolding
  - 3.5 create a work schedule and material list
  - 3.6 for a given roof section, use the appropriate tools, materials and techniques to:
    - 3.6.1 lay out the required patterns
    - 3.6.2 cut the appropriate rafters to size
    - 3.6.3 assemble and fasten
    - 3.6.4 sheath and apply a sample of one or more alternative roof coverings
  - 3.7 estimate the cost of at least one alternative roof covering

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE CON3060: DOORS & TRIM**

**Level:** Advanced

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students apply basic finish carpentry knowledge and skills to install doors, railings and mouldings.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with formal, specialized training in carpentry.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

### **1. identify common types of doors, hardware and trim products**

- 1.1 list and describe the types of components and mouldings that are used in conjunction with the installation and finishing of:
  - 1.1.1 railings
  - 1.1.2 doors
  - 1.1.3 columns
  - 1.1.4 floors and ceilings
- 1.2 describe the different ways doors are constructed
- 1.3 label the parts of a panel door
- 1.4 describe the common types of joints and methods of measuring and cutting used to install various mouldings and casings such as mitre, coped and butt joint
- 1.5 from a set of drawings, identify the styles of mouldings and calculate the amounts of material to be ordered to finish a door

### **2. install doors, mouldings and other trim products**

- 2.1 use the appropriate tools, materials and processes to:
  - 2.1.1 install a prefabricated door or bifold unit
  - 2.1.2 install a lock set
  - 2.1.3 prefinish mouldings and casing, where possible
  - 2.1.4 install room mouldings and casings

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks



**4. create a transitional strategy to accommodate personal changes and build personal values**

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

## **COURSE CON3070: FLOORCOVERING**

**Level:** Advanced

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop skills in selecting and installing typical floor coverings used in residential, institutional and commercial buildings.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in floorcovering.

**Supporting Course:** CON1070: Building Construction

**Outcomes:** The student will:

### **1. identify and describe common types of residential, institutional and commercial floorcoverings**

- 1.1 list and describe common types of residential and commercial floorcovering materials; e.g., resilient (vinyl, rubber, cork), carpet, ceramic tile, wood
- 1.2 identify the factors that are used to determine the selection of a floorcovering
- 1.3 explain how concrete and wood floors differ in the way they are prepared for a floorcovering
- 1.4 identify appropriate adhesives and fasteners for a given covering

### **2. apply flooring skills to assist in the installation of a floorcovering**

- 2.1 describe the appropriate flooring for a given application
- 2.2 calculate the cost of materials and supplies for a given area
- 2.3 measure an area and prepare a layout sketch of starter courses
- 2.4 describe the processes used to:
  - 2.4.1 rough fit, seam and stretch a carpet
  - 2.4.2 rough fit and seam a vinyl covering
  - 2.4.3 lay out a floor surface for tile, parquet and wood flooring
  - 2.4.4 nail square edge and tongue-and-groove wood flooring
  - 2.4.5 fill, sand and finish a wood floor
  - 2.4.6 set, grout and seal ceramic tile
- 2.5 use the appropriate tools, materials and processes to:
  - 2.5.1 prepare a floor surface
  - 2.5.2 install a floorcovering
  - 2.5.3 seal and finish, where applicable

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely

- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. **create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE CON3080: ENERGY-EFFICIENT HOUSING**

**Level:** Advanced

**Prerequisite:** CON1070: Building Construction

**Description:** Students investigate construction practices and support systems to create an energy-efficient housing design.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in carpentry.

**Outcomes:** The student will:

- 1. identify and describe energy-efficient construction materials and techniques**
  - 1.1 identify the factors that have contributed to more energy-efficient housing
  - 1.2 describe the construction techniques that are used in energy-efficient buildings
  - 1.3 list and describe the materials that are used to improve the energy efficiency of a building
  - 1.4 define the term R factor
  - 1.5 describe the ways heat can enter or escape from a building
  - 1.6 describe corrective measures that can be undertaken in existing buildings to improve energy efficiency
  - 1.7 identify and describe passive and active heating and cooling systems
  - 1.8 research the effects of landscaping on energy efficiency
- 2. calculate the energy efficiency of a typical residence or commercial structure**
  - 2.1 analyze an existing structure to estimate the heat loss through ceilings, walls, doors and windows
- 3. write a proposal outlining how to improve the energy efficiency of a given building**
  - 3.1 prepare a proposal for an existing building outlining the work to be done to improve efficiency and its cost effectiveness
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals





## **COURSE CON3090: RENOVATIONS/RESTORATIONS**

**Level:** Advanced

**Prerequisite:** CON1070: Building Construction

**Description:** Students work with a client to plan and complete a building renovation and/or restoration.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with formal, specialized training in carpentry.

**Outcomes:** The student will:

### **1. complete a feasibility study and cost estimate of a renovation/restoration project**

- 1.1 identify the types of renovations that are most common; e.g., changing or adding windows, creating a new entrance or opening a room, building an addition, replacing exterior finish
- 1.2 identify types of renovations that require local permits or work that requires special skills and certification
- 1.3 predict, by considering the age of the original building, the types of materials and construction techniques used in the original construction
- 1.4 identify sources of information regarding construction methods and materials used in historic buildings
- 1.5 list the materials that, for health reasons, require special care when renovating
- 1.6 identify local regulations regarding the disposal of hazardous materials
- 1.7 prepare a feasibility study by determining the:
  - 1.7.1 usefulness of the renovation
  - 1.7.2 cost of materials and labour
  - 1.7.3 disruption to the use of other living space
  - 1.7.4 structural as well as aesthetic considerations
  - 1.7.5 impact on support systems such as heating, lighting and plumbing
- 1.8 prepare a working drawing of a typical renovation
- 1.9 prepare a work schedule for a typical renovation/restoration project

### **2. apply construction skills to assist in a building renovation/restoration project, using traditional and modern construction materials and techniques**

- 2.1 apply planning, management and construction skills to complete a renovation and/or restoration project

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely

- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. **create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE CON3105: COMMERCIAL STRUCTURES**

**Level:** Advanced

**Prerequisite:** CON1070: Building Construction

**Description:** Students investigate structural designs, construction techniques and work site practices related to commercial construction.

**Parameters:** Access to a commercial construction site and/or construction facility and to instruction from an individual with formal, specialized training in carpentry.

**Outcomes:** The student will:

- 1. compare the differences between residential, institutional and commercial construction**
  - 1.1 identify the major differences between a residential and a commercial/institutional construction project
  - 1.2 compare structural steel framing techniques with those of reinforced concrete framing
  - 1.3 describe the various floor systems and components that are used in commercial/institutional construction
- 2. describe common types of materials and construction techniques used in commercial construction**
  - 2.1 describe the techniques used to build a shallow and a deep foundation for commercial/institutional buildings
  - 2.2 explain the advantage of using curtain walls in highrise buildings
  - 2.3 describe typical methods of installing utilities in commercial buildings
  - 2.4 identify common methods of finishing exterior and interior surfaces
- 3. demonstrate commercial construction job site expectations and skill requirements**
  - 3.1 identify the personal protective equipment that is required on the job site
  - 3.2 describe worker expectations on a typical job site
  - 3.3 describe the role of a safety supervisor on a job site
  - 3.4 produce a scale model or illustrated log that features common materials and techniques used in commercial/residential construction
- 4. identify and describe typical crane, hoisting and rigging equipment methods and procedures**
  - 4.1 identify typical rigging techniques that are used to transport materials
  - 4.2 demonstrate the basic lift signals used on the construction site
  - 4.3 demonstrate the proper use of:
    - 4.3.1 slings and hitches
    - 4.3.2 knots
    - 4.3.3 hand signals
  - 4.4 define the term "safe working load"
  - 4.5 describe correct methods of installing and securing scaffolding
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE CON3110: SITE MANAGEMENT**

**Level:** Advanced

**Prerequisite:** CON1070: Building Construction

**Description:** Students consider the efficient and timely delivery of a quality product. They investigate and report on site management theories and practices to produce a project management plan.

**Parameters:** Access to appropriate in-school and community resources.

**Outcomes:** The student will:

- 1. identify and describe the key elements of project management related to commercial and residential construction**
  - 1.1 identify the key elements of project management including:
    - 1.1.1 planning
    - 1.1.2 scheduling
    - 1.1.3 implementing
    - 1.1.4 controlling
  - 1.2 describe the need for good communication and cooperation between various trades and occupations on a construction site
- 2. outline the roles and responsibilities of the principal players on a construction project**
  - 2.1 describe the roles and responsibilities of the project manager in relation to:
    - 2.1.1 reviewing contractual agreements and deliverables
    - 2.1.2 establishing effective lines of communication with: clients, suppliers, contractors, inspectors
    - 2.1.3 determining site conditions and amenities; e.g., electrical, plumbing and gas supplies
  - 2.2 report on the roles and responsibilities for one or more of the following job site positions:
    - 2.2.1 site superintendent
    - 2.2.2 safety supervisor
    - 2.2.3 subtrade contractor
    - 2.2.4 foreman
    - 2.2.5 skilled worker
- 3. apply site management theories and practices to create a management plan for a construction project**
  - 3.1 compare the advantages and disadvantages of using the critical path and bar chart methods for scheduling a project
  - 3.2 identify strategies to help bring a project back on schedule
  - 3.3 identify the primary tasks of completing a project in relation to:
    - 3.3.1 managing supplies
    - 3.3.2 managing contractors
    - 3.3.3 arranging inspections
    - 3.3.4 communicating with the client
    - 3.3.5 keeping records



- 3.4 research procedures to control:
  - 3.4.1 safety on the work site
  - 3.4.2 quality of work
  - 3.4.3 removal and disposal of materials
  - 3.4.4 project costs
- 3.5 develop a work plan for a given project by determining:
  - 3.5.1 what is to be done
  - 3.5.2 how it will be done
  - 3.5.3 who will do it
  - 3.5.4 when it should be done
- 3.6 schedule the work using a bar chart or critical path technique
- 3.7 analyze a project and identify procedures to improve:
  - 3.7.1 time management
  - 3.7.2 quality of work
  - 3.7.3 health and safety
  - 3.7.4 cost efficiencies
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE CON3120: TOOL MAINTENANCE**

**Level:** Advanced

**Prerequisite:** CON1010: Construction Tools & Materials

**Description:** Students develop skills in preventive maintenance by routinely inspecting and servicing production tools and equipment.

**Parameters:** Access to a materials and/or construction facility and to instruction from an individual with specialized training in hand and power tool maintenance.

**Outcomes:** The student will:

- 1. identify and describe the essential elements and desired outcomes of a preventive maintenance program**
  - 1.1 explain reasons for establishing a preventive maintenance program
  - 1.2 identify the essential elements of a preventive maintenance program; e.g., scheduling and performing periodic maintenance functions, repairing faulty equipment, keeping records of service and maintenance work, tagging or removing equipment that is out of order
  - 1.3 identify tools that require safety accessories such as a push stick
- 2. prepare a maintenance schedule for a piece of equipment**
  - 2.1 show a list of parameters for setting up a maintenance schedule; e.g., age of equipment, frequency of use, manufacturer's recommendations, past performance
  - 2.2 list and describe the types of adjustments and service requirements of shop equipment including:
    - 2.2.1 table saws
    - 2.2.2 band saws
    - 2.2.3 scroll saws
    - 2.2.4 jointers
    - 2.2.5 surface planers
    - 2.2.6 portable equipments
    - 2.2.7 drill presses
  - 2.3 prepare a service schedule for a number of production tools and pieces of equipment
- 3. apply established maintenance procedures to assess and maintain hand and power tools**
  - 3.1 identify recommended grinding and honing angles for:
    - 3.1.1 plane irons
    - 3.1.2 wood chisels
    - 3.1.3 wood turning tools
  - 3.2 calculate twist drill point angles and lip clearances for drilling metals and plastics
  - 3.3 design a safety accessory for a specific tool
  - 3.4 demonstrate a routine inspection of laboratory tools and equipment
  - 3.5 perform maintenance services, as required
  - 3.6 build a safety accessory
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE CON3130: FURNITURE MAKING 3 (LEG & RAIL)**

**Level:** Advanced

**Prerequisite:** CON1120: Product Management

**Description:** Students use solid and/or manufactured materials and leg-and-rail or pedestal construction techniques to build a free-standing piece of furniture.

**Parameters:** Access to a materials and/or construction facility and to instruction from an individual with formal, specialized training in furniture and cabinetmaking.

**Supporting Courses:** CON2130: Furniture Making 1 (Box Construction)  
CON2140: Furniture Making 2 (Frame & Panel)

**Outcomes:** The student will:

- 1. identify and describe the design features and joinery techniques of a typical leg-and-rail piece of furniture**
  - 1.1 describe typical design and joinery techniques used in leg-and-rail and pedestal construction
  - 1.2 identify common methods and fastening systems to secure a wood top to an under frame; e.g., wood buttons, metal plates, pocket drilling, blocks
  - 1.3 describe common methods of transferring a pattern to a work piece such as a table leg or pedestal
  - 1.4 describe an appropriate method to reed and flute a surface
- 2. apply drawing and estimating skills and techniques to prepare a shop drawing, detailed materials list and cost estimate**
  - 2.1 select a product that requires the use of:
    - 2.1.1 leg-and-rail or pedestal components
    - 2.1.2 solid woods and/or composite materials
  - 2.2 interpret a working drawing to prepare a detailed materials list and event schedule
- 3. plan and build a piece of furniture, using leg-and-rail construction techniques**
  - 3.1 design and build the required jigs and templates
  - 3.2 use the appropriate tools, material and processes to:
    - 3.2.1 measure and lay out stock
    - 3.2.2 cut and shape components
    - 3.2.3 machine appropriate joints
    - 3.2.4 assemble with suitable fasteners
    - 3.2.5 prepare for finishing
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE CON3140: FURNITURE MAKING 4 (SURFACE ENHANCEMENT)**

**Level:** Advanced

**Prerequisite:** CON1120: Product Management

**Description:** Students explore and demonstrate the use of veneer, inlay, carving and/or marquetry techniques to enhance the appearance of a product or component.

**Parameters:** Access to a materials and/or construction facility and to instruction from an individual with formal, specialized training in furniture and cabinetmaking.

**Outcomes:** The student will:

**1. identify and describe methods of matching wood veneer**

- 1.1 describe the principal methods used to produce a wood veneer; e.g., rotary cutting, flat or plain slicing, quarter slicing, right and half round cutting
- 1.2 identify the methods used to match veneer including:
  - 1.2.1 slip
  - 1.2.2 diamond
  - 1.2.3 checkerboard
  - 1.2.4 book
- 1.3 describe successful cutting and applying techniques

**2. differentiate between inlay, marquetry and carving techniques**

- 2.1 differentiate between marquetry and inlaying
- 2.2 explain how hand and machine carving differ
- 2.3 identify a product or component that:
  - 2.3.1 requires veneering
  - 2.3.2 is enhanced by a carved, inlaid or marquetry feature

**3. create a veneer, inlay or carving feature for a product or component**

- 3.1 select an appropriate veneer
- 3.2 sketch the desired veneer match
- 3.3 sketch a design for a carved, inlaid or marquetry feature
- 3.4 use appropriate tools, materials and processes to:
  - 3.4.1 cut and fit a veneer
  - 3.4.2 apply and glue a veneer
  - 3.4.3 create an inlay, marquetry or carving feature

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely

- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE CON3150: FURNITURE REPAIR**

**Level:** Advanced

**Prerequisite:** CON1120: Product Management

**Description:** Students apply basic knowledge of furniture construction and materials to repair or replace existing components or coverings.

**Parameters:** Access to a materials and/or construction facility and to instruction from an individual with formal, specialized training in carpentry/cabinetry.

**Supporting Courses:** CON2150: Finishing & Refinishing  
FAS2150: Upholstery

**Outcomes:** The student will:

- 1. assess the condition of a piece of furniture to determine whether it can be economically repaired or restored**
  - 1.1 identify the factors that determine whether a piece of furniture is worth repairing or restoring
  - 1.2 describe safe and efficient methods to:
    - 1.2.1 loosen old glue and clean joints
    - 1.2.2 remove and replace dowel pins
    - 1.2.3 tighten loose joints
    - 1.2.4 patch or repair a veneer surface
    - 1.2.5 splice a component
    - 1.2.6 repair and/or replace a plastic moulding
  - 1.3 identify practical methods to determine the nature of the original structural materials and finishes
  - 1.4 identify the design features that might have caused a component to fail
  - 1.5 describe the hazards associated with stripping old paint, varnish and lacquer finishes
- 2. prepare a repair/restoration plan and cost estimate**
  - 2.1 describe the overall condition and feasibility of restoring a given piece of furniture
  - 2.2 estimate the time, supply and material cost to:
    - 2.2.1 disassemble
    - 2.2.2 strip down
    - 2.2.3 repair
    - 2.2.4 reassemble
    - 2.2.5 refinish
- 3. repair/restore a piece of furniture**
  - 3.1 use the appropriate tools, materials and processes to repair and restore a piece of furniture
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE CON3160: CABINETMAKING 3 (CABINETS/COUNTERTOPS)**

**Level:** Advanced

**Prerequisite:** CON1120: Product Management

**Description:** Students develop the knowledge and skills required to build and install a simple cabinet/countertop, complete with an appropriate backsplash and edge treatment.

**Parameters:** Access to a materials and/or construction facility and to instruction from an individual with formal, specialized training in carpentry/cabinetry.

**Supporting Course:** CON1160: Manufactured Materials

**Outcomes:** The student will:

### **1. identify and describe common types of cabinets/countertops and installation procedures**

- 1.1 identify common countertop materials including:
  - 1.1.1 ceramic tile
  - 1.1.2 plastic laminate
  - 1.1.3 natural and synthetic marble
  - 1.1.4 moulded laminates
- 1.2 identify typical methods and materials used to seal components
- 1.3 describe the processes used to:
  - 1.3.1 apply ceramic tile
  - 1.3.2 apply plastic laminates
  - 1.3.3 install manufactured tops
- 1.4 describe standard procedures to:
  - 1.4.1 cut and trim plastic laminates
  - 1.4.2 cut ceramic tile

### **2. identify and describe a suitable edge treatment for a given application**

- 2.1 identify and describe typical edge treatments used with a given cabinet/countertop material
- 2.2 select the appropriate material and edge treatment for a given application

### **3. apply/install a given material to produce a suitable cabinet/countertop**

- 3.1 prepare a detailed material and procedural list
- 3.2 identify and note the location of fixtures
- 3.3 list and demonstrate the safe use of power tools used to install cabinet/countertop materials
- 3.4 describe the health and safety issues that pertain to the use of specific solvents and adhesives
- 3.5 use the appropriate tools, materials and processes to:
  - 3.5.1 measure and mark stock
  - 3.5.2 cut and fit materials
  - 3.5.3 attach components
  - 3.5.4 apply materials and edge treatments
  - 3.5.5 locate and prepare openings for fixtures
  - 3.5.6 clean and seal



**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

## **COURSE CON3170: CABINETMAKING 4 (LAYOUT & INSTALLATION)**

**Level:** Advanced

**Prerequisite:** CON1120: Product Management

**Description:** Students develop a floor/wall cabinet plan and order and install a set of pre-built cabinets.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with formal, specialized training in carpentry/cabinetry.

**Outcomes:** The student will:

### **1. design a room layout and prepare a cabinet schedule**

- 1.1 identify and describe the principles of various kitchen, bathroom and workroom layouts
- 1.2 use a set of drawings and specifications to determine the size, location and type of modular units
- 1.3 prepare a story pole or master layout on plywood or cardboard for a specified section of a cabinet installation

### **2. lay out and install a set of cabinets and countertops**

- 2.1 describe the procedures used to level a set of cabinets
- 2.2 describe the techniques and fasteners used to attach cabinets together and to floor, ceiling and wall structures
- 2.3 check and note irregularities in walls and floors
- 2.4 identify cabinet modifications owing to irregularities and service outlets
- 2.5 use the appropriate tools, materials and processes to:
  - 2.5.1 locate and level units
  - 2.5.2 assemble and install units
  - 2.5.3 install countertops
  - 2.5.4 apply fillers and mouldings
  - 2.5.5 adjust fit of doors and drawers

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

### **4. create a transitional strategy to accommodate personal changes and build personal values**

- 4.1 identify short-term and long-term goals
- 4.2 identify steps to achieve goals



## **COURSE CON3190: PRODUCTION PLANNING**

**Level:** Advanced

**Prerequisite:** CON2200: Product Development

**Description:** Students plan, individually or as team members, a production system and create the necessary work cells and floor plan to produce a given product in a safe and efficient manner.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with specialized training in production work.

**Outcomes:** The student will:

- 1. identify the characteristics of an efficient production system**
  - 1.1 describe the factors that determine whether a product part or component will be built or purchased
  - 1.2 describe the production methods that are used to separate, combine and form materials
  - 1.3 describe common methods of material and product handling
  - 1.4 identify the conditions that contribute to an efficient production system; e.g., use of flexible equipment, zero tolerance, multi-skilled workteams, authority delegated to the workers
  - 1.5 identify methods to control:
    - 1.5.1 inventory
    - 1.5.2 production
    - 1.5.3 quality
  - 1.6 list and describe typical safety regulations that govern:
    - 1.6.1 space between equipment
    - 1.6.2 type of floor surfaces
    - 1.6.3 amount of light
    - 1.6.4 air quality control
- 2. analyze a product to determine the necessary production processes and tools**
  - 2.1 break a given product down into its separate parts and identify how each part can be fabricated
- 3. create a production flow chart and/or facility layout**
  - 3.1 show a flow chart for the movement of materials and products
  - 3.2 train personnel for specific tasks
  - 3.3 design and build the necessary jigs, fixtures and templates for a given part and process
  - 3.4 organize the required equipment to create a required work cell or shop layout
  - 3.5 test and improve the production processes, if necessary
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE CON3200: PRODUCTION MANAGEMENT**

**Level:** Advanced

**Prerequisite:** CON3190: Production Planning

**Description:** Students identify and enhance management skills in relation to the development and deployment of people and physical resources.

**Parameters:** Access to a materials and/or construction facility and to instruction from an individual with formal, specialized training in production work.

**Outcomes:** The student will:

**1. describe effective production management strategies**

- 1.1 define the role of management in a production system
- 1.2 identify and describe key management elements; e.g., planning, organizing, leading, controlling
- 1.3 identify functions that are the responsibility of a management team; e.g., marketing, research and development, production, servicing, finance, training
- 1.4 identify and describe typical scheduling techniques used by production managers such as a Program Evaluation Review Technique (PERT) chart
- 1.5 differentiate between quality control and total quality management
- 1.6 compare labour-management relations in traditional and automated settings
- 1.7 describe the role government has in overseeing production including:
  - 1.7.1 the Occupational Health and Safety Council
  - 1.7.2 the Workers' Compensation Board
  - 1.7.3 Alberta Environment

**2. develop a system to manage, schedule work, control materials and complete products**

- 2.1 prepare a PERT chart or another scheduling device for a production project

**3. use effective management skills to operate an efficient production system**

- 3.1 produce a simple business plan by outlining its purpose, performing a cash flow analysis and predicting its profitability
- 3.2 plan, implement and monitor a safety program for a production project or create a system to improve working conditions and job satisfaction

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely

4.3 demonstrate teamwork skills to:

4.3.1 work with others

4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE CON3210: FRAMING SYSTEMS 2 (FLOOR, WALL & CEILING)**

**Level:** Advanced

**Prerequisite:** CON2035: Floor Framing Systems  
CON2045: Wall Framing Systems

**Description:** Students develop appropriate layout and assembly skills to install conventional and/or engineered framing components associated with residential and/or light commercial construction.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with formal, specialized training in carpentry.

**Outcomes:** The student will:

### **1. compare conventional and engineered framing systems and components**

- 1.1 describe the parts of a typical residential floor and wall frame support system
- 1.2 identify and describe two common types of posts used in floor framing support systems
- 1.3 compare the advantages and disadvantages of using:
  - 1.3.1 built-up beams
  - 1.3.2 solid timber beams
  - 1.3.3 laminated beams
  - 1.3.4 steel beams
- 1.4 compare the advantages and disadvantages of using:
  - 1.4.1 conventional framing materials
  - 1.4.2 truss joists
  - 1.4.3 wooden I-beams
  - 1.4.4 metal joists/studs
- 1.5 identify and describe typical procedures that are used to join floor joists to a foundation or wall section
- 1.6 compare different methods used to attach floor joists to steel and to built-up beams
- 1.7 identify typical framing procedures used in relation to:
  - 1.7.1 load- and nonload-bearing partitions
  - 1.7.2 stair, chimney and stack openings
  - 1.7.3 parallel and 90° cantilevers
- 1.8 identify and describe common methods of bridging floors and bracing walls including:
  - 1.8.1 cross-bridging
  - 1.8.2 continuous wood strapping
  - 1.8.3 solid blocking
  - 1.8.4 continuous steel strapping
- 1.9 identify code requirements related to notching and drilling floor joists and wall studs
- 1.10 identify common types of subflooring materials, underlayments and wall sheathing
- 1.11 identify the purpose and types of connectors/ties and adhesives that are used in conjunction with the application of flooring and sheathing components
- 1.12 identify appropriate methods to cover floor/wall openings and construct temporary railings to code
- 1.13 describe the safe operation of portable electric and air-activated hand tools
- 1.14 identify appropriate personal protective equipment used on the job site

- 2. apply print reading and estimating principles to prepare a materials list and cost estimate for a structure that incorporates conventional and/or engineered framing components**
  - 2.1 use the appropriate tables to determine the clear spans and actual lengths of joists/headers for a variety of framing materials and applications
  - 2.2 estimate the size and quantities of materials required to construct a floor/wall/ceiling system
- 3. demonstrate advanced framing, layout and assembly skills**
  - 3.1 develop skills in relation to:
    - 3.1.1 built-up beam and header construction and installation
    - 3.1.2 cutting, layout and installation and sheathing of floor, wall and ceiling components
    - 3.1.3 squaring and applying subfloor materials
    - 3.1.4 framing walls and ceiling
  - 3.2 demonstrate the proper lifting techniques
  - 3.3 use proper personal protective equipment
  - 3.4 demonstrate appropriate temporary bracing techniques
  - 3.5 demonstrate the proper care and use of hand and power assisted tools
  - 3.6 secure all floor, wall and ceiling openings
  - 3.7 check the alignment of crowns and bridging systems, as well as the application of fasteners and adhesives
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE CON3910: CON PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

**COURSE CON3920: CON PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

**COURSE CRA3400: INTRODUCTION TO WORK SITE SAFETY**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop an understanding of basic work site safety practices.

**Parameters:** Access to a materials work centre and to instruction from an individual with specialized training in work site safety.

**ILM Resources:** Work Site Safety 020101a, Fire Prevention and Control 020101b, Ladders and Scaffolds 020101c, Workplace Hazardous Materials Information System (WHMIS) 020101d

**Supporting Resources:** Basic Math Concepts 020108a, Calculate Perimeter and Centreline Perimeter 020108b, Calculate Areas and Volumes 020108c, Calculating Ratio and Proportion, Mechanical Advantage and Percentage 020108d, Estimate Foundation Forms and Concrete 020108e, Estimate Residential Floor Systems 020108f

**Outcomes:** The student will:

1. **apply *Occupational Health and Safety Regulation* and safe work practices in the workplace**
  - 1.1 interpret *Occupational Health and Safety Regulation* related to:
    - 1.1.1 employer responsibilities
    - 1.1.2 employee responsibilities
    - 1.1.3 general safety precautions
    - 1.1.4 accidents
  - 1.2 describe the following requirements for personal protective equipment and safety measures:
    - 1.2.1 personal protective equipment
    - 1.2.2 working alone
    - 1.2.3 compressed air
    - 1.2.4 equipment guards
    - 1.2.5 trenches
    - 1.2.6 excavations
    - 1.2.7 floor openings
    - 1.2.8 fall arrest systems
    - 1.2.9 asbestos abatement
  - 1.3 describe emergency procedures for dealing with injured workers; e.g., first aid
  - 1.4 describe the following potential health hazards:
    - 1.4.1 loading scaffolding materials
    - 1.4.2 working in the heat
    - 1.4.3 working in the cold
    - 1.4.4 fatigue
    - 1.4.5 exposure to natural wood dust
    - 1.4.6 exposure to lead-based paint
    - 1.4.7 exposure to carbon monoxide
    - 1.4.8 flammable liquids and gases
    - 1.4.9 back safety

## **2. identify and describe fire classes, extinguishers, prevention and detection**

- 2.1 describe the following about fires and the appropriate fire extinguishers suitable to fight fires:
  - 2.1.1 physics of fire
  - 2.1.2 elements of fire
  - 2.1.3 ignition
  - 2.1.4 classification of fires
  - 2.1.5 portable fire extinguishers
  - 2.1.6 identification of fire extinguishers
  - 2.1.7 extinguisher maintenance
  - 2.1.8 proper use of portable fire extinguishers
- 2.2 describe procedures and equipment related to fire prevention, detection and warning including:
  - 2.2.1 fire safety considerations
  - 2.2.2 storage of rags
  - 2.2.3 fire watch
  - 2.2.4 emergency action plan
  - 2.2.5 fire safety checklist
  - 2.2.6 welding and cutting

## **3. identify and describe types and safe applications of ladders and scaffolding**

- 3.1 describe the following:
  - 3.1.1 ladder selection
  - 3.1.2 construction ladders
  - 3.1.3 design of construction ladders
  - 3.1.4 occupational health and safety
  - 3.1.5 ladder size selection
  - 3.1.6 ladder positioning
  - 3.1.7 stepladder selection
  - 3.1.8 ladder duty ratings and materials
  - 3.1.9 ladder accessories
  - 3.1.10 proper use of ladders
  - 3.1.11 precautions
- 3.2 describe the following:
  - 3.2.1 general description of scaffolds
  - 3.2.2 scaffold selection
  - 3.2.3 scaffold systems
  - 3.2.4 frame scaffold
  - 3.2.5 elevating platforms and aerial devices
  - 3.2.6 occupational health and safety
  - 3.2.7 scaffolds
  - 3.2.8 free-standing and rolling scaffolds
  - 3.2.9 guardrail systems
  - 3.2.10 scaffold planks and platforms

## **4. describe WHMIS requirements and labelling used by the construction industry**

- 4.1 describe the three key elements of WHMIS:
  - 4.1.1 education and training
  - 4.1.2 product labelling
  - 4.1.3 material safety data sheets
- 4.2 identify WHMIS labels and describe the hazards associated with controlled products; e.g., health effects from exposure to chemicals



**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals



**COURSE CRA3405: BASIC HAND, POWER TOOLS & SAFETY**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop basic hand and power tool and production skills to safely transform common building materials into useful products.

**Parameters:** Access to a materials work centre, complete with basic construction tools, and to instruction from an individual with journey person certification in the carpentry trade.

**ILM Resources:** Hand Tools 020103a, Portable Power Tools 020103b, Stationary Power Tools 020103c, Cutters, Bits and Abrasives 020103d

**Supporting Resources:** Basic Math Concepts 020108a, Calculate Perimeter and Centreline Perimeter 020108b, Calculate Areas and Volumes 020108c, Calculating Ratio and Proportion, Mechanical Advantage and Percentage 020108d, Estimate Foundation Forms and Concrete 020108e, Estimate Residential Floor Systems 020108f

**Outcomes:** The student will:

**1. identify common hand tools and describe their proper uses**

1.1 identify and describe the use of measuring, marking, laying out, aligning and squaring tools:

1.2 identify and describe the use of:

- 1.2.1 edge cutting tools
- 1.2.2 planes
- 1.2.3 chisels
- 1.2.4 utility knives
- 1.2.5 tooth-cutting tools
- 1.2.6 saws
- 1.2.7 files and rasps
- 1.2.8 scraping tools
- 1.2.9 sanding abrasives
- 1.2.10 boring and drilling tools
- 1.2.11 drills
- 1.2.12 drill bits

1.3 identify and describe the use of:

- 1.3.1 assembling tools
- 1.3.2 hammers
- 1.3.3 screwdrivers
- 1.3.4 pliers and wrenches
- 1.3.5 dismantling tools
- 1.3.6 clamping tools
- 1.3.7 curved claw hammers

## **2. identify and describe the safe operation and maintenance of portable power tools**

- 2.1 identify and describe the safe operation of portable saws including:
  - 2.1.1 portable power tool safety
  - 2.1.2 extension cords
  - 2.1.3 circular saws
  - 2.1.4 power mitre saws
  - 2.1.5 sliding compound mitre saws
  - 2.1.6 jigsaws
  - 2.1.7 reciprocating saws
- 2.2 identify and describe the safe operation of the following portable planing and shaping equipment:
  - 2.2.1 routers and laminate trimmers
  - 2.2.2 router tables
  - 2.2.3 rotary cut-out tool (spiral saw)
  - 2.2.4 power hand planes
- 2.3 identify and describe the safe operation of the following portable drilling and fastening equipment:
  - 2.3.1 portable drills
  - 2.3.2 hammer drills
  - 2.3.3 screw guns
  - 2.3.4 biscuit joiners
  - 2.3.5 electric power nailers
- 2.4 identify and describe the safe operation of the following portable abrasive tools:
  - 2.4.1 sanders
  - 2.4.2 disc sanders and grinders
  - 2.4.3 portable cut-off saws
  - 2.4.4 cordless portable power tools

## **3. identify and describe the safe operation and maintenance of stationary power tools**

- 3.1 identify and describe the safe operation and regular maintenance, including basic maintenance checks, of the following stationary saws:
  - 3.1.1 table saws
  - 3.1.2 radial arm saws
  - 3.1.3 radial arm saw styles
  - 3.1.4 radial arm saw operations
  - 3.1.5 band saws
  - 3.1.6 bevel cuts
- 3.2 identify and describe the safe operation and regular maintenance, including basic maintenance checks, of the following stationary planing tools:
  - 3.2.1 jointers
  - 3.2.2 jointer operations
  - 3.2.3 thickness planers
  - 3.2.4 thickness planer parts
- 3.3 identify and describe the safe operation and regular maintenance, including basic maintenance checks, of the following stationary drilling, grinding and sanding tools:
  - 3.3.1 drill press operations
  - 3.3.2 stationary sanders
  - 3.3.3 grinders

**4. describe the use and maintenance of cutting tools and abrasives**

- 4.1 describe the action of a cutting edge on a work piece; e.g., cutting directions
- 4.2 identify and describe the abrasive materials, machines, processes and tools used to maintain chisels, plane irons and scrapers including:
  - 4.2.1 sharpening chisels and plane irons
  - 4.2.2 grinding wheels
  - 4.2.3 whetting or honing
  - 4.2.4 scrapers
- 4.3 describe the types and uses of sanding abrasives
- 4.4 identify and describe the types, uses and maintenance of saw blades including:
  - 4.4.1 saw blade classification
  - 4.4.2 circular saws
  - 4.4.3 dado sets
  - 4.4.4 abrasive and diamond blades
- 4.5 identify and describe the types, uses and maintenance of drill bits and router bits including:
  - 4.5.1 twist drill bits
  - 4.5.2 drill sharpening procedure
  - 4.5.3 drill bits
  - 4.5.4 concrete and masonry drill bits
  - 4.5.5 router bits

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals





## **COURSE CRA3410: CONSTRUCTION MATERIALS & PROCESSES**

<b>Level:</b>	First Period Apprenticeship
<b>Prerequisite:</b>	None
<b>Description:</b>	Students examine common building materials, processes and how they relate to common building systems in the construction trade.
<b>Parameters:</b>	Access to a materials work centre, complete with basic construction tools, and to instruction from an individual with journeyperson certification in the carpentry trade.
<b>ILM Resources:</b>	Solid Wood Products and Wood Joinery 020102a, Manufactured Construction Products 020102b, Fasteners, Adhesives and Sealants 020102c, Introduction to Concrete 020102d
<b>Supporting Resources:</b>	Basic Math Concepts 020108a, Calculate Perimeter and Centreline Perimeter 020108b, Calculate Areas and Volumes 020108c, Calculating Ratio and Proportion, Mechanical Advantage and Percentage 020108d, Estimate Foundation Forms and Concrete 020108e, Estimate Residential Floor Systems 020108f
<b>Outcomes:</b>	The student will:

### **1. identify and describe solid wood products and joinery**

#### **1.1 describe common types and characteristics of solid wood products including:**

- 1.1.1 how a tree grows
- 1.1.2 anatomy of trees
- 1.1.3 cell structure and growth
- 1.1.4 classification of woods
- 1.1.5 hardwoods
- 1.1.6 softwoods

#### **1.2 describe how wood is milled, seasoned, stored and ordered including:**

- 1.2.1 milling lumber
- 1.2.2 cutting methods
- 1.2.3 milling classifications
- 1.2.4 seasoning or drying lumber
- 1.2.5 testing for moisture content
- 1.2.6 characteristics of shrinkage
- 1.2.7 lumber grading
- 1.2.8 grade stamps
- 1.2.9 defects that affect grading
- 1.2.10 natural flaws
- 1.2.11 knot shapes
- 1.2.12 knot types
- 1.2.13 manufacturing flaws
- 1.2.14 seasoning defects
- 1.2.15 grading by classification

- 1.2.16 grades of lumber for general construction and light framing
- 1.2.17 lumber size terminology
- 1.2.18 ordering, storing and handling wood products
- 1.2.19 board feet
- 1.3 identify and describe the application of commonly used mouldings
- 1.4 identify and describe the application of wood joints for fabrication and installation
- 2. identify and describe manufactured building products used in the construction industry**
  - 2.1 identify and describe the application of panel products including:
    - 2.1.1 plywood
    - 2.1.2 veneer
    - 2.1.3 other products and applications
    - 2.1.4 marking (grading)
    - 2.1.5 working with plywood
    - 2.1.6 composite panels
  - 2.2 identify and describe the application of the following engineered wood products:
    - 2.2.1 glued laminated timber products
    - 2.2.2 parallel strand lumber
    - 2.2.3 finger-jointed studs
  - 2.3 identify and describe the application of the following synthetic and metal products:
    - 2.3.1 plastic laminates
    - 2.3.2 solid plastics
    - 2.3.3 polyethylene (plastic film membranes)
    - 2.3.4 siding
    - 2.3.5 other metal products and hardware
- 3. identify different types, functions and applications of some of the more common fasteners, adhesives and sealants**
  - 3.1 identify the types and functions of fasteners commonly used in construction including:
    - 3.1.1 fasteners
    - 3.1.2 nails
    - 3.1.3 staples
    - 3.1.4 screws
    - 3.1.5 specialty screws
    - 3.1.6 bolts and nuts
    - 3.1.7 anchors
  - 3.2 identify the types and functions of adhesives commonly used in construction including:
    - 3.2.1 adhesives (glues)
    - 3.2.2 natural adhesives
    - 3.2.3 synthetic (nonreactive) glues
    - 3.2.4 synthetic (reactive) glues
  - 3.3 identify the types and functions of sealants commonly used in construction including:
    - 3.3.1 mastics
    - 3.3.2 sealants
    - 3.3.3 caulking
    - 3.3.4 caulking tools and techniques
    - 3.3.5 caulking guns

- 4. describe the ingredients, production, placing and curing of concrete**
  - 4.1 identify the ingredients and production of concrete including:
    - 4.1.1 concrete components
    - 4.1.2 Portland cement
    - 4.1.3 aggregates
    - 4.1.4 water
    - 4.1.5 water/cement ratio
    - 4.1.6 production of concrete
    - 4.1.7 ordering concrete from a ready mix plant
    - 4.1.8 concrete delivery
  - 4.2 describe the placement and curing of concrete including:
    - 4.2.1 maximum allowable placing time
    - 4.2.2 placing concrete method
    - 4.2.3 curing
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals





## **COURSE CRA3415: SITE PREPARATION & FLOOR SYSTEMS**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students examine common site preparations and floor frame systems.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with journeyperson certification in the carpentry trade.

**ILM Resources:** Preliminary Building Operations 020104a, Building Loads and Forces 020106a, Floor Frame Support Systems 020106b, Residential Floor Frames 020106c

**Supporting Resources:** Basic Math Concepts 020108a, Calculate Perimeter and Centreline Perimeter 020108b, Calculate Areas and Volumes 020108c, Calculating Ratio and Proportion, Mechanical Advantage and Percentage 020108d, Estimate Foundation Forms and Concrete 020108e, Estimate Residential Floor Systems 020108f

**Outcomes:** The student will:

### **1. identify preliminary building operations required prior to excavation and the footings being placed**

#### **1.1 describe the following initial site procedures and requirements:**

- 1.1.1 permission from local authorities
- 1.1.2 compliance with by-laws
- 1.1.3 permits
- 1.1.4 grade slips
- 1.1.5 inspections
- 1.1.6 occupancy permits
- 1.1.7 property boundaries
- 1.1.8 plot plan (site plan)
- 1.1.9 soil and the foundation

#### **1.2 describe building layout procedures**

#### **1.3 describe the application of levelling equipment including:**

- 1.3.1 optical levels
- 1.3.2 styles of optical levels
- 1.3.3 laser levels
- 1.3.4 line levels
- 1.3.5 hand levels
- 1.3.6 water levels

#### **1.4 describe excavation and shoring considerations including the:**

- 1.4.1 location of underground facilities
- 1.4.2 depth of excavation
- 1.4.3 excavation safety considerations
- 1.4.4 disposal of the soil from the excavation

**2. identify and describe the forces that act upon buildings and the design principles used to counteract these forces**

- 2.1 describe the forces, live loads and dead loads that act on a building including:
  - 2.1.1 structural loads
  - 2.1.2 static loads
  - 2.1.3 dynamic loads
  - 2.1.4 loads acting on structures
- 2.2 describe the following compressive, tensile and lateral forces that act on a building and how these forces are counteracted:
  - 2.2.1 loads and stresses
  - 2.2.2 tension
  - 2.2.3 compression
  - 2.2.4 shear
  - 2.2.5 horizontal shear
  - 2.2.6 vertical shear
  - 2.2.7 diagonal shear (tension)
- 2.3 describe the following construction design principles used to counteract loads and forces:
  - 2.3.1 materials
  - 2.3.2 concrete reinforcement
  - 2.3.3 joists
  - 2.3.4 control joints
  - 2.3.5 water
  - 2.3.6 frost action in soils
  - 2.3.7 foundation depth
  - 2.3.8 foundation walls

**3. describe floor frame support systems**

- 3.1 describe the design and construction of beam supports including:
  - 3.1.1 columns
  - 3.1.2 steel columns
  - 3.1.3 wood columns
  - 3.1.4 solid wood columns
  - 3.1.5 built-up columns
  - 3.1.6 engineered wood products
  - 3.1.7 glued-laminated columns
  - 3.1.8 concrete columns
  - 3.1.9 interior load-bearing walls
  - 3.1.10 pony walls
  - 3.1.11 beam pockets
- 3.2 describe the design and construction of commonly used beams including:
  - 3.2.1 introduction to beams
  - 3.2.2 steel beams
  - 3.2.3 beam identification
  - 3.2.4 supported joist length
  - 3.2.5 wood beams
- 3.3 describe the methods used to anchor the floor frame to the foundation including:
  - 3.3.1 ladder systems
  - 3.3.2 sill plate systems
  - 3.3.3 cast-in-place systems

**4. identify and describe the components and installation of a residential floor frame and describe floor frame support systems**

- 4.1 identify and describe the following components of a residential floor frame:
  - 4.1.1 framing styles
  - 4.1.2 platform framing
  - 4.1.3 floor system components
  - 4.1.4 bridging
  - 4.1.5 joist support
  - 4.1.6 minimum floor joist dimensions
- 4.2 describe the layout and installation procedures for floor frame systems including:
  - 4.2.1 layout
  - 4.2.2 joist spacing
  - 4.2.3 layout methods
  - 4.2.4 marking additional joists
  - 4.2.5 openings larger than code regulations
  - 4.2.6 interior walls
  - 4.2.7 mechanical
  - 4.2.8 cantilevered joists
  - 4.2.9 installation procedures
- 4.3 describe joist restraints and subfloor sheathing installation including:
  - 4.3.1 joist restraint
  - 4.3.2 layout of cross-bridging
  - 4.3.3 floor sheathing
  - 4.3.4 notching and drilling solid wood joists
- 4.4 describe the components and the installation of engineered floor systems including:
  - 4.4.1 description of engineered floor systems
  - 4.4.2 terminology for I-beams and open web trusses
  - 4.4.3 beam and joist hangers
  - 4.4.4 notching and drilling engineered joists
  - 4.4.5 trusses
  - 4.4.6 handling and storage of engineered floor components

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals



## **COURSE CRA3420: FOUNDATIONS & CONCRETE STRUCTURES**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop knowledge and skills related to the preparation and construction of a concrete foundation and/or alternative foundations.

**Parameters:** Access to a building site and/or construction facility and to instruction from an individual with journeyperson certification in the carpentry trade.

**ILM Resources:** Foundation Supports 020105a, Concrete Flatwork 020105b, Conventional Concrete Foundations 020105c, Alternate Foundation Systems 020105d

**Supporting Resources:** Basic Math Concepts 020108a, Calculate Perimeter and Centreline Perimeter 020108b, Calculate Areas and Volumes 020108c, Calculating Ratio and Proportion, Mechanical Advantage and Percentage 020108d, Estimate Foundation Forms and Concrete 020108e, Estimate Residential Floor Systems 020108f

**Outcomes:** The student will:

### **1. describe continuous and independent footings for light construction**

#### **1.1 describe the following design considerations for concrete footings:**

- 1.1.1 foundation types
- 1.1.2 grade beam foundations
- 1.1.3 foundation excavations
- 1.1.4 soil and the foundation
- 1.1.5 footing design and codes
- 1.1.6 footings
- 1.1.7 step or stepped footings

#### **1.2 describe the layout and construction of concrete footings the following:**

- 1.2.1 location of the footing
- 1.2.2 top of footing elevation
- 1.2.3 templates and anchors
- 1.2.4 reinforcement
- 1.2.5 preparations for foundation walls
- 1.2.6 placement of concrete

#### **1.3 describe the various types of piles and their construction**

### **2. construct slabs that will meet the service requirements with low construction costs and minimal future maintenance**

#### **2.1 describe the sub-grade preparation, reinforcement and concrete placing requirements for slabs on grade including:**

- 2.1.1 sub-grade preparation
- 2.1.2 the sub-base
- 2.1.3 vapour barriers
- 2.1.4 slab thickenings



- 2.2 describe the following forming methods and concrete placement methods for slabs on grade:
  - 2.2.1 locating the slab
  - 2.2.2 forming materials
  - 2.2.3 concrete joints
  - 2.2.4 placement and screeding
  - 2.2.5 screeding methods
  - 2.2.6 finishing
  - 2.2.7 curing

**3. describe construction methods for conventional concrete foundations**

- 3.1 describe the components and erection processes for Strip-Ease and other modular foundation form systems including:
  - 3.1.1 modular forming systems
  - 3.1.2 flat-bar forming systems
  - 3.1.3 tie spacings
  - 3.1.4 preplanning
  - 3.1.5 beam pockets
  - 3.1.6 window bucks
  - 3.1.7 erecting the flat-bar form system
  - 3.1.8 premanufactured or patented form systems
  - 3.1.9 erecting premanufactured forms
- 3.2 describe steel reinforcement, concrete placement and form removal for concrete foundations including:
  - 3.2.1 steel reinforcement
  - 3.2.2 floor frame attachment
  - 3.2.3 concrete placement
  - 3.2.4 placing concrete in the forms
  - 3.2.5 vibrating
  - 3.2.6 removing forms
- 3.3 describe the damp proofing, drainage and backfill requirements for concrete foundations

**4. describe alternate foundation systems**

- 4.1 identify and describe the following components of a permanent wood foundation (PWF) system and the required construction procedures:
  - 4.1.1 site preparation
  - 4.1.2 footings for PWF
  - 4.1.3 PWF framing
  - 4.1.4 framed openings
  - 4.1.5 PWF plywood
  - 4.1.6 attachment to footings
  - 4.1.7 basement floor systems
  - 4.1.8 main floor systems
- 4.2 identify and describe the following components of insulated concrete form (ICF) systems and basic construction procedures:
  - 4.2.1 ICF systems
  - 4.2.2 ICF site preparation
  - 4.2.3 ICF assembly
  - 4.2.4 reinforcing for ICF
  - 4.2.5 bracing requirements for ICF
  - 4.2.6 concrete for ICF
  - 4.2.7 inspection and repair of ICF
  - 4.2.8 exterior finishing

- 4.3 identify and describe other foundation systems including:
  - 4.3.1 concrete block foundations
  - 4.3.2 window and door bucks
  - 4.3.3 block wall components
  - 4.3.4 backfilling
  - 4.3.5 pre-cast concrete foundation systems
  - 4.3.6 assembly of pre-cast foundations
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



**COURSE CRA3425: BLUEPRINT DRAWINGS & SKETCHING**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop the knowledge and skills to use instruments to produce and interpret meaningful drawings.

**Parameters:** Access to drawing tools, drawing tables, equipment and materials and/or a computer with a software package and a printer or plotter. Access to instruction from an individual with specialized training in drafting and/or computer design.

**ILM Resources:** Drafting Basics – Part A 020107aA, Drafting Basics – Part B 020107aB, Orthographic Drawings – Part A 020107bA, Orthographic Drawings – Part B 020107bB

**Supporting Resources:** DES1050 CAD1, Basic Math Concepts 020108a, Calculate Perimeter and Centreline Perimeter 020108b, Calculate Areas and Volumes 020108c, Calculating Ratio and Proportion, Mechanical Advantage and Percentage 020108d, Estimate Foundation Forms and Concrete 020108e, Estimate Residential Floor Systems 020108f

**Outcomes:** The student will:

**1. identify and demonstrate the use of basic drawing instruments**

**1.1 describe the functions of basic drawing instruments including:**

- 1.1.1 paper sizes
- 1.1.2 set-up and basic use of the equipment
- 1.1.3 metric scale rule
- 1.1.4 imperial scale rule

**1.2 use drafting equipment to complete the following geometric exercises:**

- 1.2.1 using the set square
- 1.2.2 basic geometry exercises
- 1.2.3 bisect a line at 90°
- 1.2.4 draw a line at 90° (perpendicular) to a point on a baseline
- 1.2.5 bisect an angle
- 1.2.6 draw a 60° and a 30° angle
- 1.2.7 draw a 45° and a 22.5° angle
- 1.2.8 find the centre of a circle or an arc
- 1.2.9 draw a hexagon within a circle
- 1.2.10 draw an octagon within a square
- 1.2.11 draw parallel lines
- 1.2.12 divide lengths into equal spaces
- 1.2.13 round the intersection of two lines
- 1.2.14 divide a line into equal spaces
- 1.2.15 draw parallel lines
- 1.2.16 find the centre of a line or space

- 1.3 describe the applications of geometry in trade situations; e.g., checking tools for accuracy
- 1.4 practise producing shapes, angles and drawings to scale by using basic drafting instruments to:
  - 1.4.1 draw lines of scale
  - 1.4.2 draw an octagon centred on a page
  - 1.4.3 draw a solid wood framed door
- 2. describe the concepts and principles of orthographic projection**
  - 2.1 identify the concepts of orthographic presentation including:
    - 2.1.1 developing and positioning of views
    - 2.1.2 viewing of surfaces
- 3. sketch orthographic projections of objects that have:**
  - surfaces parallel to the viewing plane
  - hidden edges or surfaces
  - sloped surfaces
  - oblique surfaces
  - curved surfaces or holes
  - 3.1 develop the concepts of orthographic projections for:
    - 3.1.1 creating an orthographic drawing
    - 3.1.2 layout of orthographic views
    - 3.1.3 vertical and horizontal surfaces
    - 3.1.4 exercises:
      - 3.1.4.1 hidden surfaces
      - 3.1.4.2 sloped surfaces
      - 3.1.4.3 circular and curved surfaces
      - 3.1.4.4 oblique surfaces
- 4. identify and practise the drawing techniques and principles used to produce isometric drawings**
  - 4.1 describe pictorial drawing methods including:
    - 4.1.1 perspective drawings
    - 4.1.2 three-point perspective drawings
    - 4.1.3 two-point perspective drawings
    - 4.1.4 one-point perspective drawings
    - 4.1.5 oblique drawings
  - 4.2 describe the isometric principles for:
    - 4.2.1 isometric drawings
    - 4.2.2 isometric axis
    - 4.2.3 developing an isometric drawing
  - 4.3 sketch an isometric projection
  - 4.4 describe how isometric angles are shown and drawn
  - 4.5 sketch an isometric projection
  - 4.6 describe how to develop/draw isometric circles and arcs
  - 4.7 sketch an isometric projection
- 5. use basic drawing guidelines and interpretation skills to create the orthographic views, sectional views, details and cutting list required for a shop project**
  - 5.1 describe line types used in orthographic drawings
  - 5.2 demonstrate correct dimensioning methods and techniques including:
    - 5.2.1 dimensioning styles
    - 5.2.2 dimensions
    - 5.2.3 lines
    - 5.2.4 dimension text



- 5.2.5 other dimensioning considerations
- 5.2.6 rules for dimensioning
- 5.3 describe page layout and centring techniques; e.g., centring a drawing on a page
- 5.4 describe section and details and the use of material symbols including:
  - 5.4.1 sections
  - 5.4.2 cutting plane lines
  - 5.4.3 types of sections
  - 5.4.4 breaklines
  - 5.4.5 symbols
  - 5.4.6 details
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals



**COURSE CRA3430: CONSTRUCTION MACHINES, TOOLS & EQUIPMENT**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students examine and develop basic knowledge and skills related to construction machines, tools and equipment.

**Parameters:** Access to a materials work centre, complete with basic construction tools, pneumatic and explosive tools, and to instruction from an individual with specialized training.

**ILM Resources:** Construction Equipment 020104b, Explosive Actuated Tools 020103e, Pneumatic and Fuel-Powered Tools 020103f

**Supporting Resources:** Basic Math Concepts 020108a, Calculate Perimeter and Centreline Perimeter 020108b, Calculate Areas and Volumes 020108c, Calculating Ratio and Proportion, Mechanical Advantage and Percentage 020108d, Estimate Foundation Forms and Concrete 020108e, Estimate Residential Floor Systems 020108f

**Outcomes:** The student will:

**1. identify light and heavy equipment used in construction and employ safe procedures when working with cranes and hoisting equipment**

**1.1 identify and describe typical construction equipment including:**

- 1.1.1 earthmoving equipment
- 1.1.2 material-handling equipment
- 1.1.3 concrete equipment
- 1.1.4 other equipment

**1.2 identify and describe the following hoisting and rigging equipment, methods and procedures:**

- 1.2.1 cranes
- 1.2.2 other hoisting equipment
- 1.2.3 safety and on-site considerations
- 1.2.4 crane and hoisting signals
- 1.2.5 hoisting equipment and hardware (rigging)
- 1.2.6 fibre rope
- 1.2.7 rope knots, hitches and bends

**2. describe the safe operation of explosive actuated tools**

**2.1 differentiate between high and low velocity explosive actuated tools; e.g., typical applications**

**2.2 describe explosive actuated tool power loads (low and high velocity), power load strength and safety requirements including:**

- 2.2.1 types of power loads
- 2.2.2 power load strength identification
- 2.2.3 safety

**2.3 describe explosive actuated tool fasteners, accessories and applications including:**

- 2.3.1 fastener types
- 2.3.2 applied loads

- 2.4 assess base material suitability and related fastening requirements including:
  - 2.4.1 centre punch test procedures
  - 2.4.2 unsuitable base materials
  - 2.4.3 masonry or concrete base materials
  - 2.4.4 holding power (fastener load strength) masonry or concrete bore material
  - 2.4.5 steel base material
  - 2.4.6 holding power (fastener load strength) steel base material
- 2.5 describe explosive actuated system safety and firing procedures related to:
  - 2.5.1 general safety
  - 2.5.2 tool safety
  - 2.5.3 personal safety equipment
  - 2.5.4 selecting the proper fastener
  - 2.5.5 loading procedure
  - 2.5.6 firing the tool
  - 2.5.7 conversion kits
  - 2.5.8 tool accessories
- 2.6 perform tool maintenance and use an explosive actuated tool safely including:
  - 2.6.1 use of explosive actuated tools
  - 2.6.2 maintenance and storage
  - 2.6.3 safe operating practices

### **3. identify and describe the safe operation of pneumatic and fuel-powered tools**

- 3.1 identify and describe the safe operation and maintenance of pneumatic tools including:
  - 3.1.1 pneumatic (air) tools
  - 3.1.2 compressors
  - 3.1.3 extreme weather operations
  - 3.1.4 general safety and usage
  - 3.1.5 nailers
  - 3.1.6 staplers
  - 3.1.7 combustion and electric (cordless) nailers and staplers
  - 3.1.8 fasteners
  - 3.1.9 other air tools
- 3.2 identify and describe the safe operation and maintenance of fuel-powered tools including:
  - 3.2.1 gas-powered tools
  - 3.2.2 chainsaws
  - 3.2.3 chainsaw parts
  - 3.2.4 chainsaw safety equipment
  - 3.2.5 personal protective equipment
  - 3.2.6 general chainsaw safety
  - 3.2.7 correct chain tension
  - 3.2.8 proper lubrication
  - 3.2.9 saw chains
  - 3.2.10 sharpening saws
  - 3.2.11 abrasive saws

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals





## **COURSE CRA3435: BLUEPRINT INTERPRETATION**

**Level:** First Period Apprenticeship

**Prerequisite:** CRA3425: Blueprint Drawings & Sketching

**Description:** Students learn to read blueprints and gain the necessary skills required to interpret a set of working drawings.

**Parameters:** Access to drawing tools, drawing tables, equipment and materials and/or a computer with a computer-assisted drafting (CAD) software package and a printer or plotter. Access to instruction from an individual with specialized training in drafting and/or computer design.

**ILM Resources:** Pictorial Drawing and Sketching 020107c, Drawing Standards 020107d, Blueprint Reading Principles 1 – Paper Language 020107e, Blueprint Reading Principles 2 – Views and Groups of Drawings – Part A 020107fA, Blueprint Reading Principles 2 – Views and Groups of Drawings – Part B 020107fB, Blueprint Reading principles 3 – Specifications, Discrepancies and Path 020107g, Basic Blueprint Reading 020107h

**Supporting Resources:** Basic Math Concepts 020108a, Calculate Perimeter and Centreline Perimeter 020108b, Calculate Areas and Volumes 020108c, Calculating Ratio and Proportion, Mechanical Advantage and Percentage 020108d, Estimate Foundation Forms and Concrete 020108e, Estimate Residential Floor Systems 020108f

**Outcomes:** The student will:

- 1. describe and interpret the paper language used in producing a set of working drawings (blueprint)**
  - 1.1 identify and describe the different line styles used in a set of working drawings
  - 1.2 identify the common symbols used in a set of working drawings
  - 1.3 identify abbreviations commonly used on blueprints
  - 1.4 describe the page layout for drawings including:
    - 1.4.1 borders
    - 1.4.2 orientation to compass points
    - 1.4.3 title boxes
  - 1.5 identify and describe different dimensioning techniques including:
    - 1.5.1 plan dimensioning
    - 1.5.2 wood frame structure dimensioning
- 2. identify and interpret the information contained in the different views presented in a set of working drawings (blueprints)**
  - 2.1 identify the different views (drawings) and how they are viewed, and describe the paths between views including:
    - 2.1.1 the development and presentation of different views
    - 2.1.2 plans
    - 2.1.3 elevations
    - 2.1.4 building cross-sections
    - 2.1.5 sections

- 2.1.6 details
- 2.1.7 schedules
- 2.2 identify the following different groups of drawings:
  - 2.2.1 architectural drawings
  - 2.2.2 structural drawings
  - 2.2.3 mechanical drawings
  - 2.2.4 electrical drawings
  - 2.2.5 shop drawings
- 2.3 describe the following different views found in a set of plans:
  - 2.3.1 site plan and location drawings
  - 2.3.2 foundation drawings
  - 2.3.3 floor plans
  - 2.3.4 building cross-sections
  - 2.3.5 sections
  - 2.3.6 shop drawings
- 3. describe and interpret the information contained in a set of blueprints**
  - 3.1 describe specifications
  - 3.2 describe the standards for resolving discrepancies between drawings and specifications; e.g., drawing group precedence
  - 3.3 describe the steps used to navigate through a set of working drawings including:
    - 3.3.1 orientation to the drawing
    - 3.3.2 locating information
    - 3.3.3 the path — navigating through a set of drawings
    - 3.3.4 examples of navigating a set of drawings
- 4. find the required information on a set of blueprints, using systematic steps and guidelines for blueprint reading**
  - 4.1 find information and navigate between the different views in a set of blueprints including:
    - 4.1.1 developing the path to information
    - 4.1.2 working with shop drawings
    - 4.1.3 identifying discrepancies
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

**COURSE CRA3440: CRA PRACTICUM COURSE A**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns
  - 2.5 evaluate a professional in a related occupation in terms of:
    - 2.5.1 training and certification
    - 2.5.2 interpersonal skills
    - 2.5.3 technical skills
    - 2.5.4 professional ethics

### **3. demonstrate basic competencies**

#### **3.1 demonstrate fundamental skills to:**

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

#### **3.2 demonstrate personal management skills to:**

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

#### **3.3 demonstrate teamwork skills to:**

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks



**COURSE CRA3445: CRA PRACTICUM COURSE B**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns
  - 2.5 evaluate a professional in a related occupation in terms of:
    - 2.5.1 training and certification
    - 2.5.2 interpersonal skills
    - 2.5.3 technical skills
    - 2.5.4 professional ethics

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**COURSE CRA3450: CRA PRACTICUM COURSE C**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns
  - 2.5 evaluate a professional in a related occupation in terms of:
    - 2.5.1 training and certification
    - 2.5.2 interpersonal skills
    - 2.5.3 technical skills
    - 2.5.4 professional ethics

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

## **COURSE CRA3455: CRA PRACTICUM COURSE D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns
  - 2.5 evaluate a professional in a related occupation in terms of:
    - 2.5.1 training and certification
    - 2.5.2 interpersonal skills
    - 2.5.3 technical skills
    - 2.5.4 professional ethics



### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

## **COURSE ELT1010: ELECTRO-ASSEMBLY 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students apply basic fabricating and servicing techniques to construct and test electronic and electromagnetic devices and cables.

**Parameters:** Access to basic hand tools, soldering equipment, voltmeter, ohmmeter/test light and related resources.

**Outcomes:** The student will:

- 1. create a health and safety plan with special emphasis on conditions and factors related to the specific pathway or series of courses**
  - 1.1 research and identify the following eight common elements of a health and safety management system:
    - 1.1.1 management, leadership and organizational commitment including policies, guidelines and responsibilities
    - 1.1.2 hazard identification and assessment
    - 1.1.3 hazard control
    - 1.1.4 worker competency and training including: technical competence, safe work practices and procedures, personal protective equipment
    - 1.1.5 work site inspection
    - 1.1.6 incident investigation
    - 1.1.7 emergency response
    - 1.1.8 management system administration including: evaluation, records and statistics, maintenance of system
  - 1.2 explain each of the elements reflecting on occupational health and safety implications
  - 1.3 define health and safety elements relevant to the world-of-work
  - 1.4 present a health and safety plan clarifying its relevance to the work world and society in general
- 2. research common processes and methods of hazard identification, assessment and control specific to the pathway or series of courses**
  - 2.1 research and identify common job site hazard identification processes
  - 2.2 research and identify common methods for assessment and control of hazards
  - 2.3 explain and demonstrate appropriate health and safety effective practices
  - 2.4 demonstrate a proactive personal commitment toward improvement of workplace health and safety including concern for others and following instructions, rules and guidelines
- 3. apply the appropriate fabrication techniques, including proper soldering and component assembly procedures, to construct and test a simple electronic circuit**
  - 3.1 construct and analyze a simple control circuit
  - 3.2 use various breadboarding techniques to be able to understand methods used; e.g., nail and board sector and spring clip, wire wrap, point-to-point and solderless breadboard
  - 3.3 identify components
  - 3.4 measure voltage and continuity to appraise condition of circuit using appropriate instrumentation; e.g., simple alarm, simple automobile circuit, multimeter (digital and analog)

- 4. apply the appropriate fabrication techniques to construct and test an electromagnetic device**
  - 4.1 define AC/DC voltage and polarity
  - 4.2 use proper solder and soldering techniques to gain an understanding of their value
  - 4.3 analyze several magnetic devices to formulate an understanding of their function; e.g., speakers, electromagnetic crane, tape heads, moving magnetic pick-ups, relays, magnetic strip, levitation trains, magnetic device in hard drive
- 5. identify and assemble common electrical/electronic cables and connectors used in power, audio and video connections**
  - 5.1 install specialty connectors and cables to acquire knowledge and skills
  - 5.2 demonstrate an understanding of specialty cables that link systems with special functions including fibre optics, coaxial and telephone
- 6. demonstrate established laboratory procedures and safe work practices**
  - 6.1 demonstrate safe home/laboratory procedures with respect to electrical hazards and use of solder and flux
  - 6.2 identify and explain the importance of electrical protection devices
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 8.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 8.2 create a connection between a personal inventory and occupational choices

## **COURSE ELT1030: CONVERSION & DISTRIBUTION**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students experiment and work with principles of electrical energy conversion and distribution.

**Parameters:** Access to basic hand tools, a multimeter and related resources.

**Outcomes:** The student will:

- 1. identify and describe methods of converting nonrenewable and renewable sources of energy into electricity**
  - 1.1 build and/or operate one energy conversion system that produces electricity using chemical, light, heat and/or mechanical energy forms
- 2. construct an electrical distribution system**
  - 2.1 describe electrical power distribution systems from source to consumer
  - 2.2 wire common lighting and communication circuits
    - 2.2.1 breadboarding (low voltage)
    - 2.2.2 switches, lights, plugs, bells, buzzers, etc.
  - 2.3 test circuits for continuity and function
- 3. demonstrate how mechanical, chemical, light and heat energy can be converted into electrical energy**
  - 3.1 identify and describe how energy is converted into electricity in a:
    - 3.1.1 wet/dry cell
    - 3.1.2 photovoltaic cell
    - 3.1.3 thermocouple
    - 3.1.4 generator/alternator
    - 3.1.5 piezoelectric crystal
- 4. determine the cost efficiency, practicality and environmental impact of producing electricity from various sources of energy**
  - 4.1 research issues related to electrical generation, transmission and distribution systems including:
    - 4.1.1 cost efficiencies
    - 4.1.2 environmental impact of fossil fuel, hydro-electric and nuclear power plants
    - 4.1.3 conventional (fossil fuel) versus nonconventional (tidal, solar, wind) sources
  - 4.2 report on issues related to energy efficiency and conservation
  - 4.3 identify specific applications of energy conversion used in personal life
- 5. demonstrate established laboratory procedures and safe work practices**
  - 5.1 identify and follow safety procedures in a home/laboratory
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems

- 6.2 demonstrate personal management skills to:
  - 6.2.1 demonstrate positive attitudes and behaviours
  - 6.2.2 be responsible
  - 6.2.3 be adaptable
  - 6.2.4 learn continuously
  - 6.2.5 work safely
- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks
- 7. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 7.2 create a connection between a personal inventory and occupational choices



## **COURSE ELT1050: ELECTRONIC POWER SUPPLY 1**

**Level:** Introductory

**Prerequisite:** ELT1010: Electro-assembly 1

**Description:** Students construct different types of alternating and direct current power supplies and demonstrate their application in electrical/electronic systems.

**Parameters:** Access to basic hand tools, a multimeter and related resources. Direct teacher supervision for line voltage connections.

**Outcomes:** The student will:

**1. identify and describe various types of alternating and direct current power supplies**

- 1.1 distinguish and describe voltage, current and power ratings on a power supply
- 1.2 describe AC/DC power supplies
- 1.3 distinguish between the following various power supplies:
  - 1.3.1 transformers
  - 1.3.2 inverters
  - 1.3.3 converters
  - 1.3.4 eliminators
  - 1.3.5 battery
  - 1.3.6 solar
  - 1.3.7 voltage doubler/tripler
- 1.4 appraise the merits and deficiencies of half-wave bridge, full-wave bridge and centre-tap rectifiers
- 1.5 identify stages of a power supply in transformer, rectifier, filter and regulator

**2. construct a simple power supply**

- 2.1 construct simple power supplies, using perforated circuit boards

**3. test a regulated, filtered power supply for output characteristics**

- 3.1 measure power supply output using a multimeter

**4. demonstrate established laboratory procedures and safe work practices**

- 4.1 demonstrate a positive attitude of personal safety
- 4.2 identify, locate and use proper personal protective equipment

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely

- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. **make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices

## **COURSE ELT1080: CONTROL SYSTEMS 1**

**Level:** Introductory

**Prerequisite:** ELT1010: Electro-assembly 1

**Description:** Students construct process control systems, demonstrate their basic operation and demonstrate procedures for testing them.

**Parameters:** Access to digital/analog multimeters, pressure devices and related resources.

**Outcomes:** The student will:

- 1. identify how control systems are used in residential and commercial applications**
  - 1.1 draw and explain a process control system using block diagrams depicting each functional component and the flow of signals through the systems
- 2. identify basic process control systems and explain how they function**
  - 2.1 explain the difference between open-loop and closed-loop control systems
- 3. construct basic process control circuits, using passive devices**
  - 3.1 construct a basic process control system using passive devices including:
    - 3.1.1 thermistor
    - 3.1.2 pressure sensor
    - 3.1.3 proximity switch
    - 3.1.4 light control resistor
    - 3.1.5 float switch
    - 3.1.6 reed switch
    - 3.1.7 photocell
  - 3.2 explain process control terms including:
    - 3.2.1 precision
    - 3.2.2 standard
    - 3.2.3 calibration
    - 3.2.4 accuracy
    - 3.2.5 sensor
    - 3.2.6 transducers
    - 3.2.7 distortion
    - 3.2.8 transients
    - 3.2.9 sampling
    - 3.2.10 interrupt
    - 3.2.11 frequency
  - 3.3 demonstrate knowledge in measuring voltage, current and resistance in any control system using analog and digital instruments
  - 3.4 explain how to test process control circuit(s), voltage, current, continuity, opens and shorts
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 demonstrate safe and correct procedures in measuring voltage, current and resistance using digital and analog meters

**5. demonstrate basic competencies**

**5.1 demonstrate fundamental skills to:**

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

**5.2 demonstrate personal management skills to:**

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

**5.3 demonstrate teamwork skills to:**

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. make personal connections to the cluster content and processes to inform possible pathway choices**

- 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 6.2 create a connection between a personal inventory and occupational choices

## **COURSE ELT1090: ANALOG COMMUNICATION 1**

**Level:** Introductory

**Prerequisite:** ELT1010: Electro-assembly 1

**Description:** Students install and demonstrate the fundamentals of various consumer audio integrated systems.

**Parameters:** Access to consumer audio or automobile systems, multimeters and related resources.

**Outcomes:** The student will:

- 1. distinguish the difference between terms and specifications used in analog audio systems**
  - 1.1 define audio terms and specifications; e.g., wattage, peak value, sine waves, distortion, impedance matching
  - 1.2 identify various subsystems of an audio system including:
    - 1.2.1 amplifier
    - 1.2.2 preamplifier
    - 1.2.3 equalizer
    - 1.2.4 speakers
    - 1.2.5 compact disc player
    - 1.2.6 tape
    - 1.2.7 crossover
  - 1.3 identify major components of an amplifier through the use of a block diagram, identifying power supply, preamplifier and amplifier
- 2. install a functional audio system according to a given set of specifications**
  - 2.1 follow correct wiring procedures
  - 2.2 read and interpret an audio system flow connection chart
  - 2.3 install a complete audio system
  - 2.4 lay out and connect the wiring for an audio system
  - 2.5 explain and demonstrate how to test an audio device for intended function
  - 2.6 construct a simple audio device; e.g., amplifier, crossover network, fader, equalizer, distribution network, mixers or light organ
- 3. service and maintain a consumer audio system**
  - 3.1 explain and demonstrate how to troubleshoot an audio system
  - 3.2 maintain an audio system by identifying and correcting problems
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 identify causes of high current and high heat in systems
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems



- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices

## **COURSE ELT1110: SECURITY SYSTEMS 1**

**Level:** Introductory

**Prerequisite:** ELT1010: Electro-assembly 1

**Description:** Students install and demonstrate the fundamentals of sensors, control units and warning devices used in security systems.

**Parameters:** Access to specialized equipment.

**Outcomes:** The student will:

- 1. identify and compare different electronic systems used to secure people, property and information**
  - 1.1 distinguish between different types of security systems; e.g., monitored, stand-alone, closed-circuit, automobile, personal
  - 1.2 distinguish between various security devices; e.g., computer systems, hardwire, remote frequency systems
- 2. describe and compare hardwired sensors**
  - 2.1 demonstrate how to inspect various sensors; e.g., contact closure, motion, thermal, moisture detectors
  - 2.2 demonstrate how to inspect various warning devices; e.g., dialler, siren, lights
- 3. install and test a security system, evaluate circuit performance and identify possible maintenance requirements**
  - 3.1 explain and demonstrate how to install a security system
  - 3.2 demonstrate how to test and validate circuit performance using voltmeter or continuity tester
  - 3.3 explain/maintain various security systems
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 demonstrate appropriate attitudes of personal safety
  - 4.2 identify ethical points of view in using personal security systems
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks

- 6. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices

## **COURSE ELT1130: ROBOTICS 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students apply the fundamentals of robotics systems and basic robotics functions.

**Parameters:** No specialized equipment or facilities.

**Outcomes:** The student will:

- 1. describe the evolution and applications of robotics systems**
  - 1.1 distinguish between various robotics geometric systems
  - 1.2 distinguish between subsystems and their applications
- 2. identify and classify programmable robotics systems and subsystems**
  - 2.1 demonstrate an understanding of AC/DC motor controls to include switching motor states
  - 2.2 identify problem/task for robotics systems
- 3. identify and describe various alternative types of power sources**
  - 3.1 prototype a direct control robotics unit to illustrate the:
    - 3.1.1 use of computer-aided design
    - 3.1.2 hydraulic, pneumatic and electromechanical interfacing
    - 3.1.3 cumulative serial and parallel operations
  - 3.2 demonstrate operation of a robot through its predetermined set of functions
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices





## **COURSE ELT1140: ROBOTICS APPLICATIONS 1**

**Level:** Introductory

**Prerequisite:** ELT1010: Electro-assembly 1

**Description:** Students apply the fundamentals of robotics systems and basic robotics functions.

**Parameters:** Access to a programmable robotics system.

**Outcomes:** The student will:

- 1. describe the evolution and applications of programmable robotics systems**
  - 1.1 research the evolution and trends of programmable robotics systems
  - 1.2 distinguish between various programmable robotics designs
  - 1.3 explore areas where programmable robotics systems are used including outer space, medicine, manufacturing and military
- 2. identify and classify programmable robotics systems and subsystems**
  - 2.1 distinguish between subsystems and their applications
  - 2.2 identify and distinguish between teach pendant and software programming
- 3. identify and describe various alternative types of power sources**
  - 3.1 identify and describe the following power sources:
    - 3.1.1 electrochemical
    - 3.1.2 pneumatic
    - 3.1.3 solar (traditional and fuel cell)
    - 3.1.4 wind
    - 3.1.5 hydraulic
    - 3.1.6 biological
    - 3.1.7 electromagnetic
- 4. build and program a programmable robotics system**
  - 4.1 identify program download strategies including:
    - 4.1.1 teach pendant
    - 4.1.2 hardwire
    - 4.1.3 wireless
- 5. design and build a direct control robotics system**
  - 5.1 prototype a robot by:
    - 5.1.1 identifying a problem/task for a robotics system
    - 5.1.2 constructing using an engineered system
    - 5.1.3 performing serial and/or parallel operations
    - 5.1.4 demonstrating operation of a robot through its predetermined set of functions
  - 5.2 demonstrate an understanding of DC motor controls to include:
    - 5.2.1 switching motor states using a program
- 6. demonstrate established laboratory procedures and safe work practices**
  - 6.1 follow laboratory safety procedures
  - 6.2 adhere to safe equipment practices and personal protection

**7. demonstrate basic competencies**

- 7.1 demonstrate fundamental skills to:
  - 7.1.1 communicate
  - 7.1.2 manage information
  - 7.1.3 use numbers
  - 7.1.4 think and solve problems
- 7.2 demonstrate personal management skills to:
  - 7.2.1 demonstrate positive attitudes and behaviours
  - 7.2.2 be responsible
  - 7.2.3 be adaptable
  - 7.2.4 learn continuously
  - 7.2.5 work safely
- 7.3 demonstrate teamwork skills to:
  - 7.3.1 work with others
  - 7.3.2 participate in projects and tasks

**8. make personal connections to the cluster content and processes to inform possible pathway choices**

- 8.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 8.2 create a connection between a personal inventory and occupational choices

**COURSE ELT1910: ELT PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE ELT2010: ELECTRO-ASSEMBLY 2**

**Level:** Intermediate

**Prerequisite:** ELT1010: Electro-assembly 1

**Description:** Students apply electro-assembly technology to manufacture circuit boards.

**Parameters:** Access to a printed circuit fabrication kit and related resources.

**Outcomes:** The student will:

- 1. identify appropriate construction methods to fabricate a circuit board**
  - 1.1 research the benefits and drawbacks of prototype construction assembly methods
- 2. lay out and construct a simple electronic circuit board, using approved construction techniques**
  - 2.1 use schematic symbols to represent electronic components
  - 2.2 draw and/or modify schematic diagrams for a simple electronic circuit
  - 2.3 match actual components to schematic symbols
  - 2.4 use an etch-resistant pen or photographic method to make a circuit board project
- 3. use a printed circuit board and proper fabrication techniques to assemble a project**
  - 3.1 prototype an electronic circuit on a breadboard
  - 3.2 create the artwork circuit layout drawing for a printed circuit board
  - 3.3 practise printed circuit board building and component installation
  - 3.4 demonstrate appropriate safety techniques when using solder and chemicals for prototype construction
  - 3.5 evaluate the circuit using electronic instruments
  - 3.6 demonstrate how to troubleshoot an electronic circuit board
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 research illnesses caused by chemicals, solder and flux used in prototype construction
  - 4.2 identify and follow safe home/laboratory procedures while using solder, flux, photochemicals, cleaning chemicals and etching chemicals
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities





## **COURSE ELT2020: ELECTRICAL SERVICING**

**Level:** Intermediate

**Prerequisite:** ELT1010: Electro-assembly 1

**Description:** Students demonstrate the fundamental concepts of repairing, servicing and maintaining electrical and electronic equipment.

**Parameters:** Access to basic hand tools, testing equipment and related resources.

**Supporting Course:** ELT2010: Electro-assembly 2

**Outcomes:** The student will:

- 1. develop a basic repair and maintenance schedule for an electrical or electronic device**
  - 1.1 define current, resistance, magnetic field, voltage rating, temperature and wattage
  - 1.2 identify the types of data found on a name plate
  - 1.3 explain why the Canadian Standards Association (CSA) standards are applied to appliances
  - 1.4 create a service schedule including:
    - 1.4.1 nameplate data
    - 1.4.2 stages of operation
    - 1.4.3 charts and wiring schematics
    - 1.4.4 grounding techniques
    - 1.4.5 protection devices
    - 1.4.6 function of the unit
    - 1.4.7 frequency of use
    - 1.4.8 subjected conditions
    - 1.4.9 age
    - 1.4.10 cost of service
    - 1.4.11 cost of replacement service and cost to maintain and repair electrical or electronic devices by identifying potential problems and correcting
- 2. identify faults in an electrical or electronic device and propose solutions for repair**
  - 2.1 identify stages of operation of various types of electrical or electronic systems
  - 2.2 interpret a flow connection chart or wiring schematic of the system
  - 2.3 troubleshoot an electrical or electronic device
  - 2.4 explain and demonstrate how to repair electronic printed circuit boards
  - 2.5 measure the voltage, current and wattage of repaired items and compare the values with the nameplate ratings
- 3. use appropriate testing procedures to assess/repair an electrical or electronic device**
  - 3.1 describe standard procedures to locate circuit/component faults
  - 3.2 identify the problem and propose a solution to affect the repair
  - 3.3 use measurement techniques related to voltage, current, resistance, wattage and continuity to appraise the condition of the circuit
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 demonstrate a professional attitude of personal safety
  - 4.2 use proper grounding techniques, current protection and static protection when testing electronic circuits

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2030: BRANCH CIRCUIT WIRING**

**Level:** Intermediate

**Prerequisite:** ELT1030: Conversion & Distribution

**Description:** Students demonstrate the fundamentals of branch circuit wiring used in residential/commercial buildings.

**Parameters:** Access to basic hand tools, a multimeter and related resources.

**Note:** The student must have access to instruction from an individual with journeyman qualifications when projects are hardwired to main power supply and for permanent usage.

**Outcomes:** The student will:

- 1. identify and describe various branch wiring systems used in residential and commercial applications**
  - 1.1 draw schematic and pictorial diagrams of branch circuit wiring
  - 1.2 interpret architectural drawings regarding branch circuit wiring
  - 1.3 identify various wiring systems, methods and materials including:
    - 1.3.1 nonmetallic shielded cable (NMSC)
    - 1.3.2 armoured cable (BX)
    - 1.3.3 conduit and conductors
    - 1.3.4 teck cable
    - 1.3.5 raceway systems
    - 1.3.6 mineral insulated cable (Pyrotex)
    - 1.3.7 wire mould
- 2. apply Canadian Electrical Code (CEC) standards to various branch wiring system designs**
  - 2.1 compare series and parallel branch wiring circuits
  - 2.2 identify live, grounding and grounded branch circuit conductors
  - 2.3 measure voltage, current and continuity
  - 2.4 research requirements for obtaining an electrical permit
  - 2.5 identify CEC standards in branch circuit design and installation
- 3. wire a branch circuit for a residential application**
  - 3.1 demonstrate how to connect wiring to comply with CEC, local and Alberta standards
  - 3.2 demonstrate safe practices regarding grounding and overload protection of circuits and devices, such as case/receptacle grounding
  - 3.3 construct, according to CEC standards, the following branch circuits in NMSC:
    - 3.3.1 standard receptacle
    - 3.3.2 single location lamp switching
    - 3.3.3 switch receptacle
    - 3.3.4 range and/or dryer receptacle
    - 3.3.5 split receptacle
    - 3.3.6 multiple locations lamp switching
    - 3.3.7 ground fault interrupter (GFI) receptacle

- 3.4 construct, according to CEC standards, one of the above branch circuits using:
  - 3.4.1 armoured cable
  - 3.4.2 conduit raceway
- 3.5 install breakers and terminate branch circuit wiring in a single phase panelboard
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 describe the danger of electrical shocks and burns
  - 4.2 describe lockout/tagout practices
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE ELT2050: ELECTRONIC POWER SUPPLY 2**

**Level:** Intermediate

**Prerequisite:** ELT1050: Electronic Power Supply 1

**Description:** Students construct and demonstrate the fundamentals of electronic power supply technology.

**Parameters:** Access to an oscilloscope, a multimeter, an isolation transformer and related resources.

**Supporting Course:** ELT2010: Electro-assembly 2

**Outcomes:** The student will:

- 1. construct, analyze and evaluate single-phase rectifiers**
  - 1.1 identify components responsible for improved output of a regulated filtered power supply
  - 1.2 explain the fundamentals of diodes, zeners, transistors and operational amplifiers
- 2. observe and test the voltage and waveform of a switching power supply**
  - 2.1 diagram half-wave bridge, full-wave bridge and centre-tap rectifiers
  - 2.2 identify current path in half-wave bridge, full-wave bridge and centre-tap rectifiers
- 3. build and analyze the characteristics of a power supply regulated by a zener transistor**
  - 3.1 construct, energize, measure and graph the input and output of half-wave bridge, full-wave bridge and centre-tap rectifiers, and regulated power supply
- 4. build, test and analyze filtering circuits used in electronic power supplies**
  - 4.1 mathematically analyze output voltage, ripple frequency and required peak inverse voltage of a half-wave bridge, full-wave bridge and centre-tap rectifier
  - 4.2 mathematically determine component values for the construction of a regulated power supply
  - 4.3 set-up, test and analyze a switching power supply
  - 4.4 construct a full-wave, filtered and regulated power supply
  - 4.5 test regulated power supply
- 5. demonstrate established laboratory procedures and safe work practices**
  - 5.1 use an isolation transformer
  - 5.2 demonstrate safe practices, especially regarding grounding and using an oscilloscope
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely

- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks
- 7. identify possible life roles related to the skills and content of this cluster**
  - 7.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 7.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2080: CONTROL SYSTEMS 2**

<b>Level:</b>	Intermediate
<b>Prerequisite:</b>	ELT1080: Control Systems 1
<b>Description:</b>	Students demonstrate how process control technology is used in real-world applications.
<b>Parameters:</b>	Access to a power supply, an oscilloscope, a transistor checker, breadboards, a frequency counter, a digital multimeter and related resources.
<b>Outcomes:</b>	The student will:

### **1. identify discrete components used in process control**

- 1.1 relate schematic diagrams and connection symbols to real-world devices
- 1.2 explain differences between alternating current (AC) and direct current (DC) as they relate to semiconductor components
- 1.3 explain the differences among the following circuit conditions:
  - 1.3.1 grounded system
  - 1.3.2 floating system
  - 1.3.3 isolated system
- 1.4 explain the voltage, current and resistance differences among series, parallel and series parallel circuits, using Ohm's law

### **2. identify and describe analog and sensor components used in process control**

- 2.1 describe an analog signal through both open- and closed-loop control systems
- 2.2 research applications of solid-state control circuits in automotive, home and industrial application systems

### **3. construct a process control device, using analog and sensor components**

- 3.1 explain, experiment with and demonstrate knowledge of various semiconductor components by prototyping mini control circuits in various applications including:
  - 3.1.1 rectifiers
  - 3.1.2 silicon controlled rectifier transistors
  - 3.1.3 unijunction transistors
  - 3.1.4 triac
  - 3.1.5 diac
  - 3.1.6 field-effect transistors
  - 3.1.7 junction field-effect transistors
  - 3.1.8 metal-oxide-semiconductor field-effect transistors
  - 3.1.9 timers; e.g., 555s
  - 3.1.10 operational amplifiers
  - 3.1.11 solid-state relays
- 3.2 explain, experiment with and demonstrate various semiconductor transducers and sensors including:
  - 3.2.1 thermistor
  - 3.2.2 pressure sensor
  - 3.2.3 photoelectric transducers
  - 3.2.4 hall effect
  - 3.2.5 optocouplers

- 3.2.6 bar codes
- 3.2.7 light controller resistors
- 3.2.8 light-emitting diode
- 3.2.9 photodiode
- 3.2.10 phototransistor
- 3.2.11 proximity switches
- 3.3 construct an electronic project(s) to control home environment or vehicle function by:
  - 3.3.1 troubleshooting the project
  - 3.3.2 writing a technical report describing the control system operation
  - 3.3.3 developing a flow chart and block diagram to show process control in project(s)
- 3.4 demonstrate correct use and procedure in operating an oscilloscope
- 3.5 demonstrate knowledge of testing semiconductor components including transducers and sensors, multimeters, oscilloscopes, solid-state testers
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 describe hazards associated with voltage, including capacitor discharge, currents, grounded systems, floating systems and isolated systems
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE ELT2090: ANALOG COMMUNICATION 2**

**Level:** Intermediate

**Prerequisite:** ELT1090: Analog Communication 1

**Description:** Students demonstrate the fundamental concepts of electronic analog communication systems.

**Parameters:** Access to an oscilloscope, a signal generator, a transistor checker, a multimeter, a decibel (dB) meter and related resources.

**Outcomes:** The student will:

### **1. identify characteristics of analog communication systems**

- 1.1 research the history of the beginnings of electrical communication
- 1.2 describe what is meant by an analog signal
- 1.3 identify various devices used to convert sound into electrical signals
- 1.4 explain how an electrical signal is turned into sound
- 1.5 mathematically determine component values for crossover/band pass filters
- 1.6 describe how an FM or AM radio station, a television station or a theatre uses communication equipment

### **2. explain analog communication technology through project design, construction, experimentation, circuit analysis and electronic component identification**

- 2.1 draw and explain the block diagram of a simple communication model
- 2.2 identify the differences between wire and wireless telephone systems' technology and networking
- 2.3 using a block diagram, explain the operation of the following forms of analog electronic communication systems:
  - 2.3.1 telephones
  - 2.3.2 audio amplifiers
  - 2.3.3 intercom systems
  - 2.3.4 light and sound boards
  - 2.3.5 automotive sensors (analog)
- 2.4 build a small audio amplifier and/or intercom for personal use
- 2.5 construct a speaker system with low-, mid- and high-range speakers with appropriate crossover networks such as an intercom system
- 2.6 test the project using analog test instruments such as an analog multimeter and an oscilloscope

### **3. demonstrate established laboratory procedures and safe work practices**

- 3.1 identify and describe the difference between a dB meter and dB ratings of communications systems and the effects on human hearing
- 3.2 troubleshoot, repair and maintain analog communication systems used in the home including:
  - 3.2.1 portable stereo systems

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems



- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2110: SECURITY SYSTEMS 2**

**Level:** Intermediate

**Prerequisite:** ELT1110: Security Systems 1

**Description:** Students demonstrate the fundamentals of security technology used in homes, businesses and transportation systems.

**Parameters:** Access to a digital multimeter, a soldering station, a breadboard, a power supply, hand tools and related resources.

**Supporting Course:** ELT2080: Control Systems 2

**Outcomes:** The student will:

### **1. identify and describe elements of a security system**

- 1.1 explain terms including:
  - 1.1.1 transceivers
  - 1.1.2 frequency
  - 1.1.3 microwave
  - 1.1.4 infrared radiation
  - 1.1.5 relays
  - 1.1.6 open and closed contact switches
- 1.2 research long-range security monitoring

### **2. identify detection and notification devices**

- 2.1 identify and describe the following detection devices:
  - 2.1.1 proximity switches
  - 2.1.2 contact switches
  - 2.1.3 vibration detector
  - 2.1.4 glass breakage detector (foil strip)
  - 2.1.5 photoelectric beam
  - 2.1.6 ultrasonic motion detector
  - 2.1.7 microwave motion detector
  - 2.1.8 passive infrared motion detector
  - 2.1.9 dual technology detectors
  - 2.1.10 audio switch or sound discriminators
- 2.2 explain, experiment with or connect various notification devices

### **3. fabricate and operate a detection and notification alarm system for home or car use**

- 3.1 identify the following three basic elements of a security system:
  - 3.1.1 control panel
  - 3.1.2 detection devices
  - 3.1.3 means of notification (alarm)
- 3.2 research the differences between two different security systems
- 3.3 install, test and demonstrate an advanced security system incorporating a control panel, detectors and notification devices
- 3.4 explain the operation of various notification alarms by:
  - 3.4.1 identifying who is notified by each type of alarm
- 3.5 design or construct an electronic security system for personal use

- 3.6 create a flowchart and block diagram to show detection, monitoring and alarm signals
- 3.7 write a technical report describing the security system
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 describe voltage and current hazards of security systems
  - 4.2 demonstrate correct handling of batteries used in security systems
  - 4.3 demonstrate how to recharge a battery safely
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2120: ELECTRO-OPTICS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students demonstrate basic knowledge of lasers and other light wave communication applications in various electronic systems.

**Parameters:** Access to a laser experimental kit and related resources.

**Outcomes:** The student will:

### **1. identify common types and classes of lasers**

- 1.1 define the word laser
- 1.2 research Canadian Standards Association (CSA) standards/guidelines for lasers
- 1.3 define lasers in terms of power
- 1.4 draw a block diagram of a laser
- 1.5 explain four unique properties of laser light
- 1.6 describe how light can be used as a modulation medium
- 1.7 research laser technology applications

### **2. explain the operation of laser, fibre optic, infrared and hologram light wave technology**

- 2.1 define fibre optics, infrared and hologram
- 2.2 explain the following terms as related to fibre optics:
  - 2.2.1 reflection
  - 2.2.2 refraction
  - 2.2.3 lenses
  - 2.2.4 focal length
  - 2.2.5 absorption
  - 2.2.6 angle of incidence
  - 2.2.7 bar code
  - 2.2.8 cladding
  - 2.2.9 core
  - 2.2.10 attenuation
- 2.3 explain the operation of infrared communication systems
- 2.4 explain the process of producing a hologram
- 2.5 explain the six major types of lenses
- 2.6 explain the effect prisms have on light
- 2.7 explain beam splitters
- 2.8 describe the effects the following filters have on light:
  - 2.8.1 coloured gel
  - 2.8.2 interference
  - 2.8.3 dichroic
- 2.9 explain diffraction gratings
- 2.10 explain terms used in laser technology including:
  - 2.10.1 photon
  - 2.10.2 ground state
  - 2.10.3 excited state
  - 2.10.4 spontaneous emission

- 2.10.5 stimulated emission of radiation
- 2.10.6 pumping
- 2.10.7 population inversion
- 2.10.8 light amplification
- 2.10.9 lenses
- 2.10.10 multiwatt lasers
- 2.11 identify and explain the operation of the following laser components:
  - 2.11.1 power supply
  - 2.11.2 pumping device
  - 2.11.3 lasing medium
  - 2.11.4 optical resonant cavity
- 2.12 define the following types of lasers:
  - 2.12.1 crystal and glass
  - 2.12.2 excimer
  - 2.12.3 chemical
  - 2.12.4 semiconductor
  - 2.12.5 gas lasers including:
    - 2.12.5.1 helium–neon (HeNe)
    - 2.12.5.2 argon
    - 2.12.5.3 carbon dioxide
    - 2.12.5.4 krypton
- 2.13 draw a diagram of a HeNe-neon laser
- 3. construct an electro-optical project**
  - 3.1 prototype, experiment with and analyze the following light wave communication devices:
    - 3.1.1 a visible light-emitting diode transmitter
    - 3.1.2 an alarm circuit using a phototransistor or optocoupler
    - 3.1.3 a simple infrared remote control device
    - 3.1.4 using a fibre optic cable to route light to a remote location
    - 3.1.5 transmitting analog data through a fibre using a diode laser
    - 3.1.6 constructing a simple alarm using high intensity visible light-emitting diode
  - 3.2 prototype, analyze and construct an advanced laser, fibre optical, infrared or hologram project including:
    - 3.2.1 a HeNe laser experimenters system
    - 3.2.2 a pocket laser diode
    - 3.2.3 an infrared push-button remote control
    - 3.2.4 an infrared wireless speaker system
    - 3.2.5 retro-fitted old equipment using a remote control
    - 3.2.6 a laser light show
    - 3.2.7 a fibre optical communication system
    - 3.2.8 a fibre optic vibration detection
    - 3.2.9 a system for the home
    - 3.2.10 a split-beam transmission hologram
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 follow safe practices when:
    - 4.1.1 using potentially hazardous materials in project construction
    - 4.1.2 laser light radiation is present
    - 4.1.3 exposed to high voltages around lasers
    - 4.1.4 using laser classes I, II, III, IV
    - 4.1.5 working with high voltage capacitors



**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE ELT2130: MAGNETIC CONTROL DEVICES**

**Level:** Intermediate

**Prerequisite:** ELT1010: Electro-assembly 1

**Description:** Students demonstrate the fundamentals of electromagnetic control devices.

**Parameters:** Access to a multimeter, a clamp-on ammeter, a power supply, hand tools and related resources.

**Outcomes:** The student will:

**1. identify and state the function of electromagnetic control devices**

- 1.1 research the benefits and drawbacks of electromagnetic and solid-state relays
- 1.2 identify coil voltage and frequency ratings
- 1.3 identify contact voltage and current ratings
- 1.4 compare and contrast the use of relays, solenoids and actuators in electrical circuits
- 1.5 demonstrate knowledge of electromagnetism

**2. explain the operation of electromagnetically controlled systems**

- 2.1 demonstrate knowledge of activation principles

**3. design and construct electromagnetic circuits, using ladder logic systems and wiring diagrams**

- 3.1 draw a schematic and wiring diagram and construct the following electromagnetic circuits:
  - 3.1.1 toggle switch controls load
  - 3.1.2 stop/start button controls load
  - 3.1.3 toggle switch controls
  - 3.1.4 limit switches
  - 3.1.5 stop/start from two locations
  - 3.1.6 jogging
  - 3.1.7 reversing
  - 3.1.8 annunciator and indicators
- 3.2 create a flowchart of various magnetic control systems

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE ELT2140: ROBOTICS 2**

**Level:** Intermediate

**Prerequisite:** ELT1130: Robotics 1  
OR  
ELT1140: Robotics Applications 1

**Description:** Students demonstrate the fundamental concepts of sensor devices and control systems by building an electronic circuit to control a direct wire or mobile robot.

**Parameters:** Access to a multimeter, a power supply, soldering stations, hand tools and related resources.

**Outcomes:** The student will:

- 1. design and build a sensor device and control system for the robotic system**
  - 1.1 demonstrate the principles of photoelectric, sound, tactile, proximity and thermal sensors
  - 1.2 explain the operation of the electronic components and circuits used to build sensor controls
  - 1.3 explain how sensor control systems are used to control the drive circuit
  - 1.4 assemble electronic components to build a sensor
- 2. identify sensor control systems and subsystems used in robotic systems**
  - 2.1 draw and explain the various blocks in a sensor control system
  - 2.2 describe and explain sight, sound and tactile sensor devices
  - 2.3 explain the fundamentals of the control system operating the motor drives in the robotic system
  - 2.4 identify the differences among drive systems, sensor control systems and processing systems
- 3. explain sensory control circuits and components used in the robotic control system**
  - 3.1 research the benefits and drawbacks of various sensory devices that are used to control the robot
  - 3.2 describe where industry is making use of sensory control robots
- 4. operate and demonstrate the capabilities of a robotic system equipped with sensor controls**
  - 4.1 demonstrate a knowledge of sensory control systems by building a sensor control for the robot system selecting from the following:
    - 4.1.1 photoelectric
    - 4.1.2 sound
    - 4.1.3 tactile
    - 4.1.4 proximity
    - 4.1.5 thermal
  - 4.2 prototype a sensory control system and construct the circuit so that the sensor controls the motors on the robot
  - 4.3 build a sensory control and mount the sensory control on the control robot
  - 4.4 draw the schematic diagram of the sensor control circuit
- 5. demonstrate established laboratory procedures and safe work practices**
  - 5.1 demonstrate safe wiring practices when building a sensory control system
  - 5.2 use protection devices for all circuits including fusing and temperature cutoff
  - 5.3 operate robotic systems within design tolerances



**6. demonstrate basic competencies**

6.1 demonstrate fundamental skills to:

- 6.1.1 communicate
- 6.1.2 manage information
- 6.1.3 use numbers
- 6.1.4 think and solve problems

6.2 demonstrate personal management skills to:

- 6.2.1 demonstrate positive attitudes and behaviours
- 6.2.2 be responsible
- 6.2.3 be adaptable
- 6.2.4 learn continuously
- 6.2.5 work safely

6.3 demonstrate teamwork skills to:

- 6.3.1 work with others
- 6.3.2 participate in projects and tasks

**7. identify possible life roles related to the skills and content of this cluster**

- 7.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 7.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2150: ELECTRONIC CONTROLS**

**Level:** Intermediate

**Prerequisite:** ELT2130: Magnetic Control Devices

**Description:** Students demonstrate the fundamentals of ladder/relay logic programming and how the programmable logic controller (PLC) system operates.

**Parameters:** Access to a programmable logic controller, a soldering station, hand tools and related resources.

**Note:** The student must have access to instruction from an individual with journeyman qualifications when projects are hardwired to main power supply and intended for permanent usage.

**Outcomes:** The student will:

- 1. explain basic input and output hardware and fundamentals of basic programming in PLC systems**
  - 1.1 research the benefits and drawbacks of using PLC systems
  - 1.2 research where, how and why PLCs are used in industry
- 2. write a basic programming logic code, through real or programmed inputs on a PLC system to operate and control electromagnetic devices**
  - 2.1 draw and identify the various blocks of a PLC system
  - 2.2 draw PLC ladder programs complete with wiring diagrams of inputs and outputs systems
  - 2.3 describe and explain numbering systems and codes
  - 2.4 plan PLC ladder programs and wiring diagrams of the PLC system
  - 2.5 demonstrate the fundamentals of logic
  - 2.6 compare relay logic control and PLC programming
  - 2.7 convert relay ladder diagrams into PLC ladder programs
  - 2.8 identify the differences between a wired relay motor control panel and a PLC motor control panel
- 3. wire, operate and test a programmable electromagnetic device**
  - 3.1 build and program a multi-input/output PLC control installation
  - 3.2 demonstrate principles of electromagnetic relay output devices to control motors
  - 3.3 demonstrate the action of switch devices as an input sensor device
  - 3.4 design the relay logic program and construct the input and output devices so that the PLC can control electromagnetic and indicator lamps
  - 3.5 demonstrate a knowledge of PLC function by writing basic programs to operate a simple relay logic control of AC motors
  - 3.6 explain how an AC motor is operated by a PLC
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 demonstrate safe wiring practices when wiring the input and output circuits
  - 4.2 use protection devices for all circuits

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2160: ROBOTICS SENSOR 1**

**Level:** Intermediate

**Prerequisite:** ELT1140: Robotics Applications 1

**Description:** Students demonstrate how basic sensors are used in a robotic system.

**Parameters:** Access to a programmable robotic system with basic sensors and a digital multimeter.

**Outcomes:** The student will:

- 1. describe the difference between active and passive sensors**
  - 1.1 describe active and passive sensors and compare when each would be used
- 2. identify and describe basic sensors used in programmable robotics systems**
  - 2.1 describe how a basic sensor signal is produced and “read” by the programmable robotics system
  - 2.2 identify and describe the uses of the following sensors:
    - 2.2.1 touch
    - 2.2.2 imaging
    - 2.2.3 light
    - 2.2.4 speech
    - 2.2.5 sound
    - 2.2.6 smell
    - 2.2.7 temperature
    - 2.2.8 ultrasonic
    - 2.2.9 rotation
- 3. verify sensory input conversion, interpretation and reaction in programmable robotics systems**
  - 3.1 identify programmable robotics system sensor signal input requirements
- 4. devise a programmable robotics system using at least three sensors to complete a task**
  - 4.1 develop a design solution including sensor specifications for robotics function to meet design drive criteria
  - 4.2 solve a design problem incorporating at least three sensors with a minimum of one active and one passive sensor
  - 4.3 construct a programmable robotics system to meet design criteria
  - 4.4 program a programmable robotics system to accomplish design criteria
- 5. demonstrate established laboratory procedures and safe work practices**
  - 5.1 explain motor loading and safe sensor operating ranges
  - 5.2 identify and follow laboratory safety procedures
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely

- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks
- 7. **identify possible life roles related to the skills and content of this cluster**
  - 7.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 7.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE ELT2170: ROBOTICS SENSOR 2**

**Level:** Intermediate

**Prerequisite:** ELT2160: Robotics Sensor 1

**Description:** Students demonstrate how specialized sensors are used in a robotic system.

**Parameters:** Access to programmable robotic system with specialized sensors.

**Outcomes:** The student will:

**1. identify and describe specialized sensors used in programmable robotic system**

- 1.1 describe what a digital input is
- 1.2 describe what an analog input is
- 1.3 identify and describe the following sensors and their uses:
  - 1.3.1 colour
  - 1.3.2 speed
  - 1.3.3 balance (gyro)
  - 1.3.4 hall effect
  - 1.3.5 pressure
  - 1.3.6 angle sensor
  - 1.3.7 current
  - 1.3.8 compass
  - 1.3.9 voltage
  - 1.3.10 humidity
  - 1.3.11 position
  - 1.3.12 air pressure
  - 1.3.13 pH sensor
  - 1.3.14 accelerometer
  - 1.3.15 infrared
  - 1.3.16 global positioning system

**2. describe sensory input conversion, interpretation and reaction in robotics systems**

- 2.1 using design requirements select sensor type and source technical data and manufacturer

**3. identify and specify interface between processor and sensor**

- 3.1 identify processor and sensor compatibility with respect to voltage and current requirements
- 3.2 specify interface components required for processor and sensor compatibility

**4. develop a robotic system using at least three specialized sensors to complete a specific task**

- 4.1 develop a design solution including specialized sensor specifications for programmable robotic functions to meet design criteria
- 4.2 solve a design problem incorporating three specialized sensors
- 4.3 construct a programmable robotics system to meet design criteria
- 4.4 program a programmable robotic system to accomplish design criteria
- 4.5 test the robotic system to verify that fabrication and programming meet design criteria

**5. demonstrate established laboratory procedures and safe work practices**

- 5.1 identify and follow laboratory safety procedures
- 5.2 identify processor protection devices
- 5.3 identify ancillary circuit protection devices

**6. demonstrate basic competencies**

6.1 demonstrate fundamental skills to:

- 6.1.1 communicate
- 6.1.2 manage information
- 6.1.3 use numbers
- 6.1.4 think and solve problems

6.2 demonstrate personal management skills to:

- 6.2.1 demonstrate positive attitudes and behaviours
- 6.2.2 be responsible
- 6.2.3 be adaptable
- 6.2.4 learn continuously
- 6.2.5 work safely

6.3 demonstrate teamwork skills to:

- 6.3.1 work with others
- 6.3.2 participate in projects and tasks

**7. identify possible life roles related to the skills and content of this cluster**

7.1 recognize and then analyze the opportunities and barriers in the immediate environment

7.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2180:      PROCESS CONTROL**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop skills in robotics/simulation software control by creating, modifying and using programs that incorporate computer-controlled movements and events in robotics/simulation activities and applications.

**Parameters:** Access to appropriate computer equipment, software and support materials.

**Outcomes:** The student will:

- 1. demonstrate basic electronic process control software competence**
- 2. explain the theory and processes used to control a robot and/or other simulation**
  - 2.1 describe the types of tasks robots perform
  - 2.2 diagram a basic robot, labelling components including the controller
  - 2.3 describe the functions of labelled components
  - 2.4 explain the processes used to control robots
  - 2.5 give examples of the types of software used to instruct the controller
  - 2.6 give an example of when it would be feasible to use a robot over a human to perform a task
  - 2.7 give an example of when it would be feasible to use a human over a robot to perform a task
  - 2.8 explain how robotics affect society now and will affect society in the future
- 3. construct a robot or cause a robot to function, as intended, through computer control**
  - 3.1 design and implement a robotics and/or other computer simulation by following a procedure to:
    - 3.1.1 identify software and application(s)
    - 3.1.2 determine and design algorithm parameters
    - 3.1.3 collect required support resources
    - 3.1.4 input data
    - 3.1.5 apply animation or robotics software commands
    - 3.1.6 load, create, customize and modify robotics or a simulation files(s)
  - 3.2 demonstrate animation/robotic capability by:
    - 3.2.1 displaying, printing and/or exporting animation or a robotics file(s)
  - 3.3 use commands and functions to control a robot(s) in teacher-specified exercises
- 4. apply appropriate work station routines consistently**
  - 4.1 apply efficient work station positions and routines that encourage:
    - 4.1.1 good health and safety; e.g., posture, positioning of hardware and furniture
    - 4.1.2 security for hardware, software, supplies and personal work
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable

- 5.2.4 learn continuously
- 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2910: ELT PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT2920: ELT PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE ELT3010: ELECTRO-ASSEMBLY 3**

**Level:** Advanced

**Prerequisite:** ELT2010: Electro-assembly 2

**Description:** Students apply photographic processes to construct a printed circuit for an electronic project.

**Parameters:** Access to photographic printed circuit board supplies, image product equipment and related resources.

**Outcomes:** The student will:

- 1. identify three photographic printed circuit (PC) board construction methods**
  - 1.1 research the benefits and drawbacks of various photographic construction methods
- 2. design or modify a board layout to be used for photographic PC board construction**
  - 2.1 draw and/or modify schematic diagrams for an advanced electronic circuit
  - 2.2 use schematic symbols to represent electronic components
  - 2.3 match actual components to schematic symbols
- 3. construct a PC board, using a photographic method**
  - 3.1 use the circuit layout with one of the photographic methods to make a circuit board
  - 3.2 demonstrate how to troubleshoot the fabricated electronic circuit board
  - 3.3 use multimeter for voltage, current and resistance checks
- 4. assemble a project, using a PC board**
  - 4.1 create the photographic artwork circuit layout for a PC board
- 5. demonstrate established laboratory procedures and safe work practices**
  - 5.1 describe illness caused by chemicals, solder and flux materials used in prototype construction
  - 5.2 demonstrate appropriate safety techniques when using solder and chemicals for prototype construction
  - 5.3 identify and follow safety procedures in home/laboratory while using solder, flux, photochemicals, cleaning chemicals and etching chemicals
  - 5.4 use Workplace Hazardous Materials Information System (WHMIS) data sheets
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks

**7. create a transitional strategy to accommodate personal changes and build personal values**

7.1 identify short-term and long-term goals

7.2 identify steps to achieve goals



## **COURSE ELT3020: ELECTRONIC SERVICING**

**Level:** Advanced

**Prerequisite:** ELT2020: Electrical Servicing

**Description:** Students develop and apply basic processes and skills to service and repair consumer-based electronic products.

**Parameters:** Access to a Dynamic Measuring Machine (DMM), an isolation transformer, an oscilloscope, a soldering iron, chemical cleaners, chamois cleaning sticks, foam swabs, a transistor tester, a capacitance meter and related resources. Access to optional equipment; e.g., colour pattern generator, Cathode Ray Tube (CRT) tester/restorer, high voltage test probe, alignment tools.

**Supporting Course:** ELT2090: Analog Communication 2

**Outcomes:** The student will:

- 1. use a block diagram to show the function and stages of operation of an electronic device**
  - 1.1 identify the stages of operation of various consumer systems
  - 1.2 interpret a flow diagram and schematic of various consumer systems
- 2. identify system faults and propose solutions to service and repair various digital and analog consumer products**
  - 2.1 identify problems associated with various consumer products and propose a solution to affect the repair
  - 2.2 use an oscilloscope to determine period in seconds and frequency in hertz
  - 2.3 identify measurements in engineering notation
  - 2.4 identify and test components in faulty section(s)
  - 2.5 demonstrate how to:
    - 2.5.1 service a faulty section
    - 2.5.2 clean user controls
    - 2.5.3 adjust colour balance, vertical height/linearity of a television or monitor
    - 2.5.4 clean a video cassette recorder (VCR) head and tape running system
    - 2.5.5 adjust a VCR tape tracking system
    - 2.5.6 clean belts and lubricate a VCR
    - 2.5.7 repair or replace printed circuit boards
- 3. use standard, safe practices to service/repair an electronic component or device**
  - 3.1 demonstrate a safe attitude
  - 3.2 use proper grounding techniques when testing consumer electronic devices
  - 3.3 use proper handling techniques when working on cathode ray tubes and high voltages
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE ELT3030: POWER SYSTEMS & SERVICES**

**Level:** Advanced

**Prerequisite:** ELT2030: Branch Circuit Wiring

**Description:** Students construct, operate, analyze and evaluate various single-phase and three-phase power systems and services.

**Parameters:** Access to a three-phase power supply, three-phase panel transformers, a wattmeter, a multimeter, an AC current meter, knife switches, a fused safety disconnect switch, a volt-amp clamp or probe and related resources.

**Note:** The student must have access to instruction from an individual with electrical technologist or journeyperson status when he or she is performing practical components using anything other than low voltages.

**Outcomes:** The student will:

- 1. follow established, safe laboratory procedures and practices when working with three-phase systems**
  - 1.1 demonstrate safe practices in all activities, observing lockout and tagout procedures
- 2. construct and analyze a three-wire, single-phase electrical system**
  - 2.1 analyze single-phase, three-wire systems for voltages and currents
  - 2.2 identify and diagram wye and delta systems
  - 2.3 energize various three-phase wye and delta circuits; measure line, phase voltages and currents
  - 2.4 diagram and construct a mock-up of a house service, according to the Canadian Electrical Code (CEC)
- 3. analyze common reluctance inductance vector diagrams**
  - 3.1 diagram two-meter and three-meter wattmeter connections to measure three-phase power
  - 3.2 diagram current transformer connections
  - 3.3 solve phasor diagrams using trigonometry
- 4. construct and analyze three-wire, three-phase and four-wire, three-phase wye systems**
  - 4.1 energize various three-phase wye and delta circuits; calculate and measure three-phase power consumed
  - 4.2 develop and use a three-phase power formula
  - 4.3 mathematically analyze three-phase, four-wire wye systems for neutral currents
- 5. construct and analyze three-wire, three-phase delta systems**
  - 5.1 evaluate three-phase, three- and four-wire delta systems
  - 5.2 diagram and construct a mock-up of a three-phase service, according to the CEC
  - 5.3 mathematically analyze three-phase, three-wire delta and three-phase, three-wire wye systems for line and phase voltage and currents
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems

- 6.2 demonstrate personal management skills to:
  - 6.2.1 demonstrate positive attitudes and behaviours
  - 6.2.2 be responsible
  - 6.2.3 be adaptable
  - 6.2.4 learn continuously
  - 6.2.5 work safely
- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE ELT3040: GENERATION/TRANSFORMATION**

**Level:** Advanced

**Prerequisite:** ELT1030: Conversion & Distribution

**Description:** Students operate, experiment with and analyze alternators and transformers used in power generation and distribution.

**Parameters:** Access to an AC/DC motor generator set, a transformer kit, AC/DC volt ammeters, a multimeter and related resources.

**Note:** The student must have access to instruction from an individual with electrical technologist or journey person status when students are operating low voltage alternators.

**Outcomes:** The student will:

- 1. explain the principles of operation of electrical components used in safety devices**
  - 1.1 differentiate between overload and overcurrent protection
- 2. set up and operate three-phase low voltage alternators in no load and load conditions**
  - 2.1 demonstrate a knowledge of alternator function by operating a three-phase alternator for various voltages, frequencies and phase sequences
- 3. explain the operational and loading parameters for alternators**
  - 3.1 build a working model of a three-phase alternator
- 4. operate a low voltage alternator in parallel with another alternator(s)**
  - 4.1 set up and operate or report on the operation of alternators in parallel
  - 4.2 compare alternators and generators
  - 4.3 inspect transformer installations used to produce the correct voltage for consumer's equipment
- 5. describe the operating principles of single-phase transformers**
  - 5.1 construct, operate and analyze step-up, step-down, 1:1, and isolation and variable transformers including:
    - 5.1.1 Jacob's ladder
    - 5.1.2 Tesla coil
    - 5.1.3 mutual induction coil
- 6. identify fundamental loading characteristics of single-phase transformers**
  - 6.1 explain principles of transformer action including:
    - 6.1.1 apparent power
    - 6.1.2 voltage ratio
    - 6.1.3 turns ratio
    - 6.1.4 power transfer
    - 6.1.5 voltage, amperage rating
  - 6.2 explain schematic symbols and nameplate ratings
- 7. demonstrate established laboratory procedures and safe work practices**
  - 7.1 demonstrate safe practices regarding high voltage system application and use of isolation transformers
  - 7.2 use various electrical tests to ensure the safety of equipment/projects
  - 7.3 describe dangers related to rotating shafts



**8. demonstrate basic competencies**

- 8.1 demonstrate fundamental skills to:
  - 8.1.1 communicate
  - 8.1.2 manage information
  - 8.1.3 use numbers
  - 8.1.4 think and solve problems
- 8.2 demonstrate personal management skills to:
  - 8.2.1 demonstrate positive attitudes and behaviours
  - 8.2.2 be responsible
  - 8.2.3 be adaptable
  - 8.2.4 learn continuously
  - 8.2.5 work safely
- 8.3 demonstrate teamwork skills to:
  - 8.3.1 work with others
  - 8.3.2 participate in projects and tasks

**9. create a transitional strategy to accommodate personal changes and build personal values**

- 9.1 identify short-term and long-term goals
- 9.2 identify steps to achieve goals

## **COURSE ELT3110: AMPLIFIERS**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students demonstrate knowledge of various types and classes of amplifiers.

**Parameters:** Access to assorted types of amplifiers and related resources.

**Supporting Course:** ELT2050: Electronic Power Supply 2

**Outcomes:** The student will:

### **1. explain the differences among various types and classes of amplifiers**

#### **1.1 define terms including:**

- 1.1.1 biasing
- 1.1.2 class A, AB, B, C amplifiers
- 1.1.3 common emitter amplifier
- 1.1.4 common collector circuit configuration
- 1.1.5 common base circuit configuration
- 1.1.6 impedance matching
- 1.1.7 capacitor coupling
- 1.1.8 multistages
- 1.1.9 bypass capacitors
- 1.1.10 inverting and non-inverting amplifiers
- 1.1.11 operational amplifiers
- 1.1.12 metal-oxides-semiconductor field-effect transistors (MOSFETs)
- 1.1.13 junction gate field-effect transistors (JFETs)

#### **1.2 explain the function and operation of direct current (DC), audio, video, power, radio frequency (RF) and intermediate frequency (IF) amplifiers**

#### **1.3 describe a Darlington-pair arrangement**

#### **1.4 explain how a differential amplifier operates**

#### **1.5 identify three different types of power amplifiers**

#### **1.6 explain how volume and tone can be controlled in an audio amplifier**

#### **1.7 explain the basic differences between RF and IF amplifiers**

#### **1.8 list three ways of increasing the bandwidth in RF and IF amplifiers**

#### **1.9 draw a block diagram of a multistage audio amplifier**

#### **1.10 describe the operation of operational amplifiers using inverting and non-inverting circuits**

#### **1.11 choose the appropriate amplifier configuration for an application**

#### **1.12 calculate voltage gain and power gain in decibels**

### **2. construct, analyze and test amplifier circuits and components**

#### **2.1 construct a 25-watt amplifier project (audio or video)**

#### **2.2 evaluate completed project**

#### **2.3 construct and experiment with amplification circuits including:**

- 2.3.1 DC amplifier
- 2.3.2 class A amplifier
- 2.3.3 complementary class B Amplifier
- 2.3.4 class B push-pull circuit

- 2.3.5 class AB amplifier
- 2.3.6 two-stage, RC-coupled audio amplifier
- 2.3.7 basic audio power amplifier
- 2.3.8 push-pull power amplifier
- 2.3.9 IC amplifiers used in large audio system; e.g., car cassette systems, consumer audio systems
- 2.3.10 JFET used as a common-drain amplifier
- 2.3.11 JFET used as a common-gate amplifier
- 2.3.12 basic differential operational amplifier
- 3. maintain, test and troubleshoot a power amplifier**
  - 3.1 troubleshoot a multistage common-emitter amplifier to determine which amplifier stage is faulty
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 demonstrate how to:
    - 4.1.1 measure voltage and current in an amplifier
    - 4.1.2 handle solid-state components
    - 4.1.3 use electronic test equipment
    - 4.1.4 install transistors using heat sinks
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE ELT3140: MOTORS**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students demonstrate knowledge of electric motor operation and loading characteristics.

**Parameters:** Access to single-phase alternating current (AC) motor and direct current (DC) motors and related resources.

**Note:** The student must have access to instruction from an individual with electrical technologist or journeyperson status when students are performing practical components other than low voltage.

**Supporting Courses:** ELT2080: Control Systems 2  
ELT2130: Magnetic Control Devices  
ELT3040: Generation/Transformation

**Outcomes:** The student will:

### **1. explain electromotive principles as applied to DC and single-phase AC motors**

- 1.1 explain and demonstrate motor principles including:
  - 1.1.1 counter electromotive force (EMF)
  - 1.1.2 inductance
  - 1.1.3 conductive resistance
- 1.2 describe and explain characteristics of the following AC and DC motors:
  - 1.2.1 shaded pole
  - 1.2.2 split phase
  - 1.2.3 capacitor start and run
  - 1.2.4 three-phase
  - 1.2.5 universal
  - 1.2.6 single-phase synchronous
  - 1.2.7 stepper
  - 1.2.8 servo
  - 1.2.9 permanent magnet
- 1.3 describe methods of DC motor control including:
  - 1.3.1 pulse width modulations
  - 1.3.2 positional feedback/shaft encoding

### **2. explain the operational characteristics of common DC and AC motors**

- 2.1 explain the following nameplate ratings:
  - 2.1.1 voltage
  - 2.1.2 current
  - 2.1.3 horsepower
  - 2.1.4 efficiency
  - 2.1.5 cycle
  - 2.1.6 revolutions per minute (RPM)
  - 2.1.7 phase

2.1.8 frame size

2.1.9 enclosure

**3. set up selected DC and AC motors and demonstrate their loading characteristics**

3.1 design and construct the following motor circuits to find torque versus load and speed regulation versus load on:

3.1.1 inductive motors including: split phase, capacitor start, permanent split capacitor, shaded pole, three-phase

3.1.2 brush motors including: universal, flat compound DC motor

3.1.3 others including: single-phase synchronous, stepper, servo, permanent magnet

**4. demonstrate established laboratory procedures and safe work practices**

4.1 identify and follow safe wiring practices

4.2 use protection devices for all circuits

4.3 describe dangers of shaft rotation regarding:

4.3.1 vibration

4.3.2 long hair

4.3.3 clothing

4.3.4 jewelry

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

5.1.1 communicate

5.1.2 manage information

5.1.3 use numbers

5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

5.2.1 demonstrate positive attitudes and behaviours

5.2.2 be responsible

5.2.3 be adaptable

5.2.4 learn continuously

5.2.5 work safely

5.3 demonstrate teamwork skills to:

5.3.1 work with others

5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

6.1 identify short-term and long-term goals

6.2 identify steps to achieve goals



## **COURSE ELT3150: ROBOTICS 3**

**Level:** Advanced

**Prerequisite:** ELT2140: Robotics 2

**Description:** Students demonstrate remote/autonomous control systems by constructing circuits to control robotic behaviour.

**Parameters:** Access to robotic trainer, surplus electromechanical components (optional) and related resources.

**Supporting Course:** NET3040: Microprocessor Interface

**Outcomes:** The student will:

- 1. identify and assemble the required components to build a frequency remote control or microprocessor control for a robotics unit**
  - 1.1 demonstrate the principles of either a remote frequency control or a programming address code control
  - 1.2 explain the operation of the electronic components and circuit used to build either a remote control robot or a programmable control robot
  - 1.3 research the benefits and drawbacks of various remote and/or microprocessor controls that are used to operate a robot
  - 1.4 describe where industry is making use of remote and microprocessor control robots
- 2. identify various microprocessor control systems and subsystems used in robotic units**
  - 2.1 draw and explain the various blocks in either a remote control system or programmable microprocessor/control system
  - 2.2 describe and explain use of sight, sound and tactile sensor control systems with either the remote control system or the programmable microprocessor control system
- 3. explain frequency control or microprocessor control circuits and components in robotics units**
  - 3.1 explain the fundamentals of either the remote control system or the programmable microprocessor control system controlling the motor drives in the robotic system
  - 3.2 identify the differences between a remote control system and a programmable control system on how the robot gains information about its environment
  - 3.3 explain how sensor controls help either the remote control or the programmable control robot to receive feedback from the environment
- 4. operate a robotic system that has various feedback controls**
  - 4.1 demonstrate knowledge of either a remote control or a programmable control system by building either a remote control or a microprocessor control for a mobile robot system
  - 4.2 prototype either a remote control system or a programmable control system and construct the circuit so that either the remote control or the programmable control will control the motors on the mobile robot
  - 4.3 draw the schematic diagram of the printed circuit board and wiring schematic of the control circuitry
  - 4.4 assemble electronic components to build a mobile robot
  - 4.5 build either a remote control or a programmable control and mount either control on the mobile robot

- 5. demonstrate established laboratory procedures and safe work practices**
  - 5.1 identify and follow safe wiring practices when working with radio frequency (RF)
  - 5.2 use protection devices for all circuits
  - 5.3 operate robotics systems within design tolerances
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE ELT3160: CONTROL APPLICATIONS**

**Level:** Advanced

**Prerequisite:** ELT2150: Electronic Controls

**Description:** Students demonstrate the fundamentals of programmed controls and demonstrate how sensing devices are integrated to control output devices.

**Parameters:** Access to program logic controller, associated input/output devices and related resources.

**Note:** The student must have access to instruction from an individual with electrical technologist or journeyperson status when he or she is performing practical components using anything other than low voltage.

**Supporting Courses:** ELT2130: Magnetic Control Devices  
ELT3140: Motors

**Outcomes:** The student will:

- 1. identify and describe input and output hardware components and the methods of programming**
  - 1.1 draw and identify addressing, ladder logic and wiring diagram of a programmable logic controller (PLC) installation
  - 1.2 describe and explain numbering systems and codes for internal logic control
  - 1.3 plan PLC ladder programs and wiring diagrams using advanced programming logic functions
  - 1.4 create a flow diagram to write programming logic
  - 1.5 compare relay logic and PLC programming
- 2. use programming logic, including real or programmed inputs, to control electromagnetic devices**
  - 2.1 demonstrate principles of electromagnetic motor starters to control large current flow to output devices
  - 2.2 demonstrate principles of feedback loop input sensors to protect output devices
  - 2.3 demonstrate the action of overload and limit switch feedback loop input sensors to protect the output system
  - 2.4 demonstrate knowledge of how either a direct current (DC) or an alternating current (AC) motor is operated by a PLC
  - 2.5 demonstrate knowledge of how analog to digital conversions are done on a PLC
- 3. use various instruction codes to operate and control electromagnetic devices**
  - 3.1 identify the difference between real-world devices and internal program devices when programming the PLC
  - 3.2 research the benefits and drawbacks of using PLCs
  - 3.3 research how PLCs are used in computer-integrated manufacturing
  - 3.4 build a multiple motor and PLC-controlled installation and write a program to control the installation
  - 3.5 demonstrate a knowledge of PLC function by writing advanced programs to operate a relay-controlled AC motor

- 3.6 design programming functions with input and output devices so the PLC can control electromagnetic devices and indicator lamps
- 3.7 draw PLC ladder programs complete with wiring diagrams of input and output systems
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 identify and follow safe wiring practices when wiring input and output circuits
  - 4.2 use protection devices for all circuits
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE ELT3170: ROBOTICS MICROPROCESSORS**

**Level:** Advanced

**Prerequisites:** ELT1140: Robotics Applications 1  
CSE3120: Object Oriented Programming 1

**Description:** Students compare central processing unit (CPU) architecture of programmable robotics engineered systems and interface with analog sensors.

**Parameters:** Access to a programmable robotics system and manufacturer's engineering literature, analog sensors and related interfaces.

**Outcomes:** The student will:

- 1. compare the internal architecture of various programmable robotics systems**
  - 1.1 compare the difference in internal architecture between different robotics system microprocessors
  - 1.2 explain the differences between machine and assembly language and interpretive and compiler language
  - 1.3 explore the types of microprocessors used in at least three types of robotics systems
- 2. analyze the engineering data of a programmable robotics system**
  - 2.1 define the following terms:
    - 2.1.1 microprocessor
    - 2.1.2 input/output
    - 2.1.3 instruction set
    - 2.1.4 operand
    - 2.1.5 mnemonic
    - 2.1.6 opcode
    - 2.1.7 data/address
  - 2.2 define and explain how the following are used in programming:
    - 2.2.1 inherent, immediate and direct addressing
    - 2.2.2 conditional and unconditional branching
    - 2.2.3 stack operation/pointer, cascade, pop/push/pull instructions
    - 2.2.4 subroutines
    - 2.2.5 carry, negative, zero, overflow and flag operation
  - 2.3 explain the purpose of the following functional sections in a microprocessor:
    - 2.3.1 input/output
    - 2.3.2 accumulator
    - 2.3.3 program counter
    - 2.3.4 instruction decoder
    - 2.3.5 controller
    - 2.3.6 data register
    - 2.3.7 address register
    - 2.3.8 stack pointer
    - 2.3.9 index pointer
  - 2.4 illustrate a block diagram of a microprocessor system showing its internal architecture
  - 2.5 define a machine cycle and explain how it impacts microprocessor programming
  - 2.6 explain how clock frequency affects microprocessor speed



- 2.7 define how sensor input cycle relates to microprocessor speed
- 2.8 describe the function of input interfacing
- 2.9 explain how an analog input is interpreted by a microprocessor
- 3. build and program a robot to accomplish specified tasks**
  - 3.1 write and execute programs that use analog and/or digital input devices
  - 3.2 solve a design problem and build a programmed robotics system incorporating the solution
  - 3.3 program a robotics system using one digital input and calculate the machine cycles required for a programmed robotics system to complete a task given a digital input device
  - 3.4 program a robotics system using one analog input and calculate the machine cycles required for a programmed robotics system to complete a task given an analog input device
  - 3.5 program a robotics system using one analog input requiring an interface and calculate the machine cycles required for a programmed robotics system to complete a task
  - 3.6 build, program and verify the operation of a robotics system that uses at least one sensor interface to perform a specified task
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 identify and follow laboratory safety procedures
  - 4.2 be aware of potential damage to the microprocessor due to voltage and current conditions
  - 4.3 demonstrate proper safety procedures while testing microprocessor systems
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE ELT3180: ROBOTICS VISION SYSTEMS**

**Level:** Advanced

**Prerequisite:** ELT2170: Robotics Sensor 2

**Description:** Students examine various types of vision in a programmable robotics system.

**Parameters:** Access to a programmable robotics system with data acquisition and manipulation capabilities and passive or active vision sensor input.

**Outcomes:** The student will:

**1. describe the difference between active and passive vision sensors**

- 1.1 describe the difference in vision types in robotics systems including:
  - 1.1.1 differentiate between active and passive vision
  - 1.1.2 describe at least three types of passive vision
  - 1.1.3 describe at least three types of active vision
- 1.2 describe how each of the following could be used in a robotics vision system:
  - 1.2.1 presence or absence of light
  - 1.2.2 light intensity
  - 1.2.3 night vision capabilities
  - 1.2.4 distance away from an object

**2. identify and describe how global positioning can be used for vision**

- 2.1 describe global positioning
- 2.2 describe how the following devices are used to track locations:
  - 2.2.1 compass sensor
  - 2.2.2 motor feedback
  - 2.2.3 gyroscopic sensor
- 2.3 describe a strategy for using global positioning systems (GPS) for robotics vision where actual GPS is used

**3. identify and describe methodologies for object recognition**

- 3.1 describe how a simulated GPS system can be integrated with visual sensors to allow a robotics system to navigate using:
  - 3.1.1 shape
  - 3.1.2 colour
  - 3.1.3 heat signature

**4. identify and describe methods for object avoidance**

- 4.1 utilize robot footprint requirements to identify and describe object avoidance strategies including:
  - 4.1.1 barriers
  - 4.1.2 hazards
  - 4.1.3 environment

**5. design, build and program a passive vision robotics system**

- 5.1 solve a design problem and build a programmed robotics system incorporating the solution
- 5.2 design, build and program a robotics system that uses at least two different passive vision devices to accomplish a specific task; the robotics system must have an interaction between inputs and outputs

- 6. design, build and program an active vision robotics system**
  - 6.1 design, build and program a robotics system that uses at least one active vision device to accomplish a specified task; the robotics system must use the active vision device to interact with the environment
- 7. demonstrate established laboratory procedures and safe work practices**
  - 7.1 identify and follow laboratory safety procedures
  - 7.2 be aware of potential damage to robotics systems due to voltage and current conditions
  - 7.3 demonstrate proper safety procedures while working with robotics systems
- 8. demonstrate basic competencies**
  - 8.1 demonstrate fundamental skills to:
    - 8.1.1 communicate
    - 8.1.2 manage information
    - 8.1.3 use numbers
    - 8.1.4 think and solve problems
  - 8.2 demonstrate personal management skills to:
    - 8.2.1 demonstrate positive attitudes and behaviours
    - 8.2.2 be responsible
    - 8.2.3 be adaptable
    - 8.2.4 learn continuously
    - 8.2.5 work safely
  - 8.3 demonstrate teamwork skills to:
    - 8.3.1 work with others
    - 8.3.2 participate in projects and tasks
- 9. create a transitional strategy to accommodate personal changes and build personal values**
  - 9.1 identify short-term and long-term goals
  - 9.2 identify steps to achieve goals

## **COURSE ELT3190: ROBOTICS KINEMATICS & BEHAVIOUR**

**Level:** Advanced

**Prerequisite:** ELT3170: Robotics Microprocessors

**Description:** Students examine the calibration of robots and programmed behaviours in a programmable robotics system.

**Parameters:** Access to a programmable robotics system and manufacturer's engineering literature.

**Outcomes:** The student will:

- 1. examine various sources of robot motion error, methods of error recovery and calibration**
  - 1.1 identify and describe sources of motion error such as:
    - 1.1.1 mechanical
    - 1.1.2 accumulated
    - 1.1.3 inertia
    - 1.1.4 propagation
  - 1.2 identify and describe methods of error recovery for each of the following errors:
    - 1.2.1 mechanical
    - 1.2.2 accumulated
    - 1.2.3 inertia
    - 1.2.4 propagation
  - 1.3 identify and describe methods of error measurement and calibration utilizing both mechanical and software solutions
- 2. describe a coordinate system and its implementation in a programmable robotics system**
  - 2.1 define a coordinate system
  - 2.2 explain how a coordinate system can be implemented for control of a robotics system
  - 2.3 explain how a polar coordinate system can be implemented for control of a programmable robotics system
- 3. develop a programmable robotics system through a coordinate system and calculate motion error for a specific task**
  - 3.1 solve a design problem and build a programmable robotics system incorporating the solution
  - 3.2 build and program a programmable robotics system using a Cartesian and/or polar coordinate system to complete a specified task
  - 3.3 calculate motion error for the specified task
  - 3.4 calibrate a programmable robotics system to perform within the specified task parameters
- 4. demonstrate established laboratory procedures and safe work practices**
  - 4.1 identify and follow laboratory safety procedures
  - 4.2 be aware of potential damage to the microprocessor due to voltage and current conditions
  - 4.3 demonstrate proper safety procedures while testing microprocessor systems
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE ELT3200: ROBOTICS ARTIFICIAL INTELLIGENCE**

**Level:** Advanced

**Prerequisite:** ELT3170: Robotics Microprocessors

**Description:** Students examine artificial intelligence in a robotics system.

**Parameters:** Access to a programmable robotics system with data acquisition and manipulation capabilities.

**Outcomes:** The student will:

- 1. identify and describe how artificial intelligence can be used in a programmable robotics system**
  - 1.1 define artificial intelligence with respect to robotics systems
  - 1.2 examine an existing artificial intelligence system (hardware and software) and report on the key components of the system including:
    - 1.2.1 behaviour
    - 1.2.2 movement strategies
    - 1.2.3 task learning
    - 1.2.4 sensor location
    - 1.2.5 actuation feedback
    - 1.2.6 exploration
    - 1.2.7 research
  - 1.3 describe how artificial intelligence can be used in a robotics system to allow it to learn a task
  - 1.4 describe the effects artificial intelligence systems have on society with respect to:
    - 1.4.1 law enforcement
    - 1.4.2 military applications
    - 1.4.3 disaster and/or accident response
    - 1.4.4 medical
    - 1.4.5 manufacturing
- 2. identify and describe knowledge acquisition strategies and implementation in programmable robotics systems**
  - 2.1 identify and describe knowledge acquisition strategies in robotics systems including:
    - 2.1.1 sensor type and input information
    - 2.1.2 learned time-sequencing
    - 2.1.3 sampling
    - 2.1.4 maze analysis and learning
  - 2.2 identify and describe methodologies for task repeatability in a robotics system
  - 2.3 describe how a task can be accomplished in a robotics system without repeating the "search" pattern
- 3. design, build and program a robotics system incorporating artificial intelligence**
  - 3.1 solve a design problem and build a programmable robotics system incorporating the solution
  - 3.2 build and program a robotics system that uses artificial intelligence to accomplish a specific task including:
    - 3.2.1 sampling for learning a task/behaviour
    - 3.2.2 repeating without sampling

4. **demonstrate established laboratory procedures and safe work practices**
  - 4.1 identify and follow laboratory safety procedures
  - 4.2 be aware of potential damage to robotics systems due to voltage and current conditions
  - 4.3 demonstrate proper safety procedures while working with robotics systems
5. **demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
6. **create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE ELT3205: EXPERT SYSTEMS**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students acquire knowledge of expert systems, such as artificial intelligence and virtual reality. They gain competence by developing or modifying programs that incorporate computer-controlled environments and multimedia interactive activities and applications.

**Parameters:** Access to an appropriate computer work station, software and support materials.

**Outcomes:** The student will:

- 1. develop an information portfolio on expert systems and other advanced technologies**
  - 1.1 identify simulation software/application(s); e.g., telerobotics, telecollaboration, telepresence systems, architecture, audio and/or airline industry, medicine, physical fitness and entertainment
  - 1.2 plan, create and modify a program and/or activity according to provided instructions
  - 1.3 collect required support resources
- 2. program an application, using one of these systems and present the results**
  - 2.1 apply expert systems software commands/instructions/codes to:
    - 2.1.1 load, create, customize and modify expert systems software templates, stacks, files or simulation applications that support artificial intelligence and/or virtual reality projects; or to scratch program/modify existing program(s)
  - 2.2 input data by:
    - 2.2.1 designing/defining project parameters; e.g., flowchart sequence
    - 2.2.2 entering data; e.g., key, load data
  - 2.3 create or import graphic elements and manipulates using appropriate software by:
    - 2.3.1 creating backgrounds
    - 2.3.2 editing, modifying and updating data and information
    - 2.3.3 using resident commands
    - 2.3.4 linking file(s)
    - 2.3.5 incorporating text (alphabetic, numeric), graphics, motion and sound
    - 2.3.6 demonstrating artificial intelligence, virtual reality and other high technology capability
  - 2.4 output expert systems activities by:
    - 2.4.1 displaying, printing and exporting artificial intelligence files and virtual reality files
- 3. apply appropriate work station routines consistently**
  - 3.1 apply efficient work station positions and routines that encourage:
    - 3.1.1 good health and safety; e.g., posture, positioning of hardware and furniture
    - 3.1.2 security for hardware, software, supplies and personal work
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

**COURSE ELT3910: ELT PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

**COURSE ELT3920: ELT PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

## **COURSE FAB1010: FABRICATION TOOLS & MATERIALS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop knowledge and skills in the use of basic hand tools and materials used in fabrication processes, and safely transform common metals into useful products.

**Parameters:** Access to a materials work centre, complete with basic hand tools.

**Outcomes:** The student will:

- 1. create a health and safety plan with special emphasis on conditions and factors related to the specific pathway or series of courses**
  - 1.1 research and identify the following eight common elements of a health and safety management system:
    - 1.1.1 management, leadership and organizational commitment including policies, guidelines and responsibilities
    - 1.1.2 hazard identification and assessment
    - 1.1.3 hazard control
    - 1.1.4 worker competency and training including: technical competence, safe work practices and procedures, personal protective equipment
    - 1.1.5 work site inspection
    - 1.1.6 incident investigation
    - 1.1.7 emergency response
    - 1.1.8 management system administration including: evaluation, records and statistics, maintenance of system
  - 1.2 explain each of the elements reflecting on occupational health and safety implications
  - 1.3 define health and safety elements relevant to the world-of-work
  - 1.4 present a health and safety plan clarifying its relevance to the work world and society in general
- 2. research common processes and methods of hazard identification, assessment and control specific to the pathway or series of courses**
  - 2.1 research and identify common job site hazard identification processes
  - 2.2 research and identify common methods for assessment and control of hazards
  - 2.3 explain and demonstrate appropriate health and safety effective practices
  - 2.4 demonstrate a proactive personal commitment toward improvement of workplace health and safety including concern for others and following instructions, rules and guidelines
- 3. identify and describe the safe use of basic hand tools used in fabricating an artifact or structure**
  - 3.1 identify and describe basic hand tools that are used to measure, mark, hold, cut, form, fasten and finish materials
  - 3.2 identify and describe basic tools and equipment used in one or more fabrication processes; e.g., welding, bar, tubular and sheet fabrication, foundry operations, machining

- 4. identify and compare the properties of common ferrous and non-ferrous metals used in fabrication processes**
  - 4.1 identify and compare the properties of a variety of ferrous and non-ferrous metals used in fabrication processes
  - 4.2 identify common shapes, sizes and forms of fabrication materials
- 5. apply fabrication processes and skills in a safe manner to produce a useful product**
  - 5.1 describe appropriate methods to handle, recycle, store and dispose of materials
  - 5.2 identify and demonstrate the appropriate use of personal protective equipment
  - 5.3 identify steps to be taken in the event of an accident
  - 5.4 outline the typical phases in a production system including:
    - 5.4.1 planning
    - 5.4.2 fabricating
    - 5.4.3 assembling
    - 5.4.4 finishing
    - 5.4.5 evaluating
  - 5.5 select or modify a plan for a simple product that will meet a defined need
  - 5.6 identify and select the appropriate tools, materials and processes required to make the product
  - 5.7 list the steps that are required to make a product in a safe and logical order
  - 5.8 develop basic fabrication skills by building, assembling and finishing a variety of products
  - 5.9 describe ways to improve product quality and productivity
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 7.2 create a connection between a personal inventory and occupational choices



## **COURSE FAB1040: OXYACETYLENE WELDING**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students develop basic skills in the safe handling and operation of oxyacetylene equipment.

**Parameters:** Access to a materials work centre, complete with oxyacetylene welding equipment and fabrication facilities, and to instruction from an individual with formal, specialized training in basic oxyacetylene welding.

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by recognizing health and safety hazards associated with oxyacetylene welding**
  - 1.1 describe how oxygen and acetylene gases are produced, stored and transported
  - 1.2 analyze the construction of a oxygen and acetylene cylinder
  - 1.3 explain the purpose and operation of a gas regulator and welding torch
  - 1.4 match the type of gas with the appropriate type of hose, cylinder and threaded connection
  - 1.5 describe how welding tips are sized
  - 1.6 describe how welding tips are cleaned
  - 1.7 describe the hazards associated with oxyacetylene welding in relation to the:
    - 1.7.1 use of personal protective equipment
    - 1.7.2 use of flammable gases under pressure
    - 1.7.3 need to remove or protect all combustible materials around the welding area
  - 1.8 describe a plan of action in the event of an accident
- 2. perform safe oxyacetylene start-up and shut-down procedures**
  - 2.1 describe and demonstrate the safe start-up and shut-down procedures for oxyacetylene welding
- 3. demonstrate basic oxyacetylene welding competencies**
  - 3.1 describe the characteristics of:
    - 3.1.1 an oxidizing flame
    - 3.1.2 a carburizing flame
    - 3.1.3 a neutral flame
  - 3.2 identify typical weld types; e.g., fillet, groove, plug
  - 3.3 identify typical weld positions; e.g., flat, horizontal, vertical, overhead
  - 3.4 list and describe the basic weld joints; e.g., butt, lap, tee, corner, edge
  - 3.5 prepare a selection of coupons for welding lap joints
  - 3.6 select the appropriate tip for a given application
  - 3.7 identify appropriate gas pressure for proper flame control
  - 3.8 identify the appropriate fire extinguisher in the event of a fire
  - 3.9 demonstrate proficiency in:
    - 3.9.1 creating lines of fusion without using a filler rod
    - 3.9.2 creating lines of fusion with a filler rod
    - 3.9.3 welding fillet welds in the flat position
  - 3.10 complete a visual inspection of a weld by considering the overall appearance, size and shape of the beads, plate penetration, fusion, and degree of undercutting and overlapping

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE FAB1048: SEMI-AUTOMATED/AUTOMATED WELDING**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students develop basic knowledge and skills related to the use of Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) processes in both personal use and commercial applications. They also develop introductory knowledge of Submerged Arc Welding (SAW) processes.

**Parameters:** Access to a fabrication work centre complete with GMAW and/or FCAW equipment and supplies, and to instruction from an individual with formal, specialized training in arc welding practices.

**Supporting Course:** FAB1050: Basic Electric Welding

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by identifying health and safety hazards associated with GMAW, FCAW and SAW**
  - 1.1 identify and explain safety issues related to:
    - 1.1.1 electrical shock
    - 1.1.2 toxic fumes
    - 1.1.3 radiant energy from the arc
  - 1.2 describe a safety plan in case of an accident
  - 1.3 identify basic components and operation principles for GMAW, FCAW and SAW processes
  - 1.4 describe the basic care, handling and storage for GMAW and FCAW wires
- 2. identify power sources used in GMAW, FCAW and SAW processes**
  - 2.1 relate knowledge of basic electrical terms to power sources used in GMAW, FCAW and SAW processes
  - 2.2 identify the function of slope and inductance in CV power sources
  - 2.3 demonstrate knowledge of the following basic electrical terms:
    - 2.3.1 direct and alternating current
    - 2.3.2 voltage
    - 2.3.3 amperage
    - 2.3.4 resistance
    - 2.3.5 polarity
    - 2.3.6 open circuit voltage and arc voltage
- 3. select appropriate electrode wires and shielding gases for use in GMAW and FCAW processes**
  - 3.1 describe and compare methods of metal transfer in GMAW, FCAW and SAW processes; e.g., short arc, globular, spray arc
  - 3.2 explain the advantages and disadvantages of GMAW, FCAW and SAW processes
  - 3.3 explain the advantages and disadvantages of the following different types of wire feed systems:
    - 3.3.1 push
    - 3.3.2 pull
    - 3.3.3 push-pull
  - 3.4 describe welding gun assemblies for GMAW and FCAW processes
  - 3.5 describe GMAW and FCAW electrode wires
  - 3.6 identify applications for the more commonly used GMAW and FCAW wires

- 3.7 explain the purpose of shielding gases
- 3.8 identify different types of shielding gases and explain their effects
- 3.9 explain the advantages and disadvantages of different shielding gases in specific applications
- 3.10 describe the purpose and operation of a regulator/flowmeter
- 3.11 for a given type of weld and/or weldment, select the appropriate:
  - 3.11.1 wire type, size and feed rate
  - 3.11.2 current
  - 3.11.3 shielding gas type and flow rate
- 3.12 select the appropriate solid/flux cored wire and machine settings
- 4. perform safe start-up and shut-down procedures for GMAW and/or FCAW processes**
  - 4.1 identify different drive roll assemblies
  - 4.2 describe the steps taken to set up GMAW and FCAW equipment including:
    - 4.2.1 fasten cylinders
    - 4.2.2 mount regulator/flowmeter
    - 4.2.3 pressurize/depressurize systems
    - 4.2.4 set/check drive wheel tension
- 5. demonstrate safe GMAW and/or FCAW processes on light gauge mild steel and/or mild steel plate in the flat and horizontal positions**
  - 5.1 identify typical weld types; e.g., fillet, groove, plug or slot, stud
  - 5.2 identify typical weld positions; e.g., flat, horizontal, vertical, overhead
  - 5.3 list and describe the basic weld joints; e.g., butt, lap, tee, corner, edge
  - 5.4 prepare and clean all surfaces to be welded by removing any:
    - 5.4.1 oil and/or grease
    - 5.4.2 paint, rust or scale
  - 5.5 make light-gauge fillet welds in the flat and horizontal positions, using GMAW and/or FCAW equipment
  - 5.6 complete a visual inspection of the weld by observing:
    - 5.6.1 overall appearance
    - 5.6.2 size and shape of beads
    - 5.6.3 plate penetration
    - 5.6.4 fusion
    - 5.6.5 degree of undercutting and overlapping
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks

**7. make personal connections to the cluster content and processes to inform possible pathway choices**

- 7.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 7.2 create a connection between a personal inventory and occupational choices





## **COURSE FAB1050: BASIC ELECTRIC WELDING**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students develop basic skills related to the safe use and operation of one or more common electric welding processes.

**Parameters:** Access to a materials work centre, complete with electric welding equipment and fabrication facilities, and to instruction from an individual with formal, specialized training in basic Gas Metal Arc Welding (GMAW) and/or Shielded Metal Arc Welding (SMAW).

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by identifying health and safety hazards associated with electric welding processes**
  - 1.1 identify and describe the following common electric welding processes and approved abbreviations:
    - 1.1.1 GMAW
    - 1.1.2 Gas Tungsten Arc Welding (GTAW)
    - 1.1.3 SMAW
  - 1.2 describe the hazards associated with GMAW and SMAW
  - 1.3 demonstrate how personal protective equipment is used to protect eyes, skin and respiratory system
  - 1.4 describe a safety plan in case of an accident
  - 1.5 describe the need to remove or protect all combustible materials in the welding area
  - 1.6 identify and locate the appropriate fire extinguisher and fire blanket
- 2. perform safe GMAW and/or SMAW start-up and shut-down procedures**
  - 2.1 describe from a weld specification the:
    - 2.1.1 type of equipment to be used
    - 2.1.2 size and type of electrode/wire
    - 2.1.3 weld settings
    - 2.1.4 type of weld, joint and weld position
    - 2.1.5 weld dimensions
  - 2.2 describe the start-up and shut-down procedures for a given piece of equipment
  - 2.3 locate all pertinent safety equipment and clamping apparatus
- 3. demonstrate basic arc welding competencies**
  - 3.1 describe how an arc is produced and controlled in GMAW and/or SMAW
  - 3.2 explain the purpose of the electrode coating and/or shielding gas in their respective processes
  - 3.3 identify the essential components and accessories used in GMAW and/or SMAW
  - 3.4 identify typical weld types including:
    - 3.4.1 fillet
    - 3.4.2 groove
    - 3.4.3 plug or slot
    - 3.4.4 surfacing

- 3.5 identify typical weld positions including:
  - 3.5.1 flat
  - 3.5.2 horizontal
  - 3.5.3 vertical
  - 3.5.4 overhead
- 3.6 list and describe the following basic weld joints:
  - 3.6.1 butt
  - 3.6.2 lap
  - 3.6.3 tee
  - 3.6.4 corner
  - 3.6.5 edge
- 3.7 prepare weld surfaces by removing any:
  - 3.7.1 oil and/or grease
  - 3.7.2 paint, rust or scale
- 3.8 demonstrate basic skills in:
  - 3.8.1 selecting equipment and accessories
  - 3.8.2 setting machine parameters
  - 3.8.3 connecting work leads
  - 3.8.4 striking an arc using a tapping and scratching technique
  - 3.8.5 running a stringer and weave bead
  - 3.8.6 performing fillet welds in the flat position using SMAW and GMAW processes
- 3.9 complete a visual inspection of a weld by considering the overall appearance, size and shape of the bead
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE FAB1090: SHEET FABRICATION 1 (HAND PROCESSES)**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students use basic tools, materials and processes to fabricate sheet materials into finished products, models or prototypes.

**Parameters:** Access to a materials work centre, complete with basic hand tools.

**Outcomes:** The student will:

**1. identify and describe the basic tools and processes used to fabricate sheet stock**

- 1.1 identify the common types and sources of sheet and board stock; e.g., card stock, sheet metal, acrylic plastic, corrugated card and plastic, foam board, styrofoam

**2. demonstrate basic measurement and layout skills and techniques**

- 2.1 identify and demonstrate the appropriate transfer and marking processes for a variety of sheet and board materials
- 2.2 prepare a pattern or template to transfer folding and cutting lines
- 2.3 create a systematic sequence of operations to fabricate a product
- 2.4 demonstrate basic skills related to the use of:
  - 2.4.1 layout and marking tools
  - 2.4.2 cutting tools
  - 2.4.3 forming tools
  - 2.4.4 bonding materials
  - 2.4.5 fastening devices

**3. apply basic sheet stock fabrication skills and techniques to produce a product**

- 3.1 describe the process of separating sheet stock by:
  - 3.1.1 shearing
  - 3.1.2 scoring and snapping
  - 3.1.3 sawing
  - 3.1.4 hot wire cutting
- 3.2 describe the process of forming sheet stock using a:
  - 3.2.1 strip heater
  - 3.2.2 box and pan brake
  - 3.2.3 slip roll
  - 3.2.4 vacuum former
- 3.3 research typical joining and fastening techniques related to the use of:
  - 3.3.1 mechanical joints and fasteners
  - 3.3.2 adhesive
  - 3.3.3 cohesives
- 3.4 apply suitable finishes and surface details to a model, prototype or product
- 3.5 analyze a product for the overall attention to:
  - 3.5.1 workmanship
  - 3.5.2 accuracy
  - 3.5.3 structural soundness
  - 3.5.4 quality of finish

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices



## **COURSE FAB1100: FABRICATION PRINCIPLES**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students investigate and apply fundamental principles of fabrication to build an artifact or structure from common structural materials.

**Parameters:** Access to a materials work centre, complete with basic hand tools.

**Outcomes:** The student will:

### **1. identify and describe the principles of separating, forming and combining materials**

- 1.1 list and describe three distinct ways of changing the shape of a material; e.g., separating, forming, combining (joining)
- 1.2 describe and give examples of tools that:
  - 1.2.1 shear
  - 1.2.2 chip
  - 1.2.3 abrade
- 1.3 identify other current and emerging processes that use the following to shape a material:
  - 1.3.1 heat
  - 1.3.2 light
  - 1.3.3 chemicals
- 1.4 outline principal methods of forming materials by:
  - 1.4.1 bending or twisting
  - 1.4.2 forging
  - 1.4.3 casting
- 1.5 research processes that can be used to:
  - 1.5.1 polish
  - 1.5.2 coat
  - 1.5.3 plate a surface to protect or improve the appearance of a product
- 1.6 demonstrate basic skills related to separating, combining and forming processes

### **2. describe the characteristics and give examples of permanent, semipermanent and temporary fastening systems**

- 2.1 list and describe common types of mechanical fasteners that are used with metal products
- 2.2 identify and describe typical bonding techniques that are used to combine metals; e.g., soldering, braze welding, bonding
- 2.3 describe when to use permanent, semipermanent and temporary fastening techniques
- 2.4 explain why it may be necessary to change the physical state of some materials before they can be formed

### **3. demonstrate basic fabrication skills and techniques, using simple hand and power tools**

- 3.1 identify and describe measurement and layout tools that can be used to:
  - 3.1.1 measure and mark a straight line on a metal surface
  - 3.1.2 make an angle of 45° and 90°
  - 3.1.3 create arcs and circles
  - 3.1.4 measure the inside and/or outside dimensions of pipe, round and square stock

- 3.2 for a given product design, describe the appropriate processes and tools to measure, lay out, shape, condition and finish the materials
- 3.3 prepare a material list and sequence of events to fabricate a given product design
- 3.4 describe principles of shop safety
- 3.5 describe a safety plan in case of an accident
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE FAB1110: BAR & TUBULAR FABRICATION**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students use cutting, bending and fastening processes to create a variety of products from bar and tubular stock.

**Parameters:** Access to a materials work centre, complete with basic hand tools and metal forming equipment.

**Outcomes:** The student will:

- 1. list and describe common shapes and sizes of bar and tubular stock**
  - 1.1 identify common sizes and shapes of bar and tubular stock
- 2. demonstrate approved material handling and storage practices**
  - 2.1 describe the most appropriate way to safely store and handle bar and tubular stock
- 3. apply basic bar and tubular fabrication skills and techniques to produce a product**
  - 3.1 identify common methods of laying out and marking stock
  - 3.2 describe typical methods of cutting bar and tubular stock to length
  - 3.3 describe how to form:
    - 3.3.1 eyes
    - 3.3.2 circles
    - 3.3.3 scrolls
    - 3.3.4 square and zero bend radii using a metal bender
  - 3.4 describe how to calculate the bend allowance for bar and tubular stock
  - 3.5 calculate the bend allowance for a given radius
  - 3.6 describe when heat is required to bend a bar or tube
  - 3.7 research appropriate fastening techniques using:
    - 3.7.1 mechanical fasteners
    - 3.7.2 welding processes
  - 3.8 describe how to prefinish and finish a bar or tubular product to prevent corrosion and improve appearance
  - 3.9 create a materials list and work schedule from a shop drawing
  - 3.10 demonstrate the safe use of hand- and power-assisted equipment
  - 3.11 describe health and safety issues associated with the use of finishing materials
  - 3.12 describe a safety plan in case of an accident
  - 3.13 demonstrate basic skills related to:
    - 3.13.1 laying out and marking stock
    - 3.13.2 cutting stock to length
    - 3.13.3 bending arcs and angles
    - 3.13.4 fastening components
    - 3.13.5 finishing the product

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE FAB1120: FOUNDRY 1 (ONE-PIECE PATTERN)**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students develop the basic skills required to produce a simple one-piece pattern, a sand mould and a finished casting.

**Parameters:** Access to a materials work centre, complete with foundry supplies and equipment, and to instruction from an individual with specialized training in basic foundry.

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by recognizing health and safety hazards associated with casting metal**
  - 1.1 describe the operation of a foundry furnace and safe methods of handling and pouring molten metal
  - 1.2 list the types of personal protective equipment and the circumstances under which it should be worn
  - 1.3 describe a safety plan in case of an accident
- 2. demonstrate basic pattern making skills to make a one-piece mould**
  - 2.1 outline the basic procedures used to make a mould with a one-piece pattern
  - 2.2 list and describe the types of patterns used to make sand moulds
  - 2.3 identify the types of materials that are suitable for making a pattern
  - 2.4 design or locate an article that can be cast using a one-piece pattern
  - 2.5 select a suitable pattern making material
- 3. demonstrate basic sand casting skills, using a one-piece pattern**
  - 3.1 list examples of everyday products that are made by casting
  - 3.2 explain how a cast part differs from a forged part
  - 3.3 list common metals used to make castings; e.g., aluminum, brass, bronze, iron
  - 3.4 describe the major casting processes including:
    - 3.4.1 sand casting
    - 3.4.2 die casting
    - 3.4.3 investment casting
  - 3.5 identify and describe the parts of a sand mould
  - 3.6 describe the advantages and disadvantages of a water-moistened sand and an oil-bonded sand
  - 3.7 explain why a flux is used when a metal is melted
  - 3.8 identify common tools and equipment used in sand casting
  - 3.9 describe the kind and amount of metal that is required for a given casting
  - 3.10 describe the melting point and appropriate flux for a specified metal
  - 3.11 evaluate the quality of sand and foundry metal



- 3.12 use the appropriate tools, materials and processes to:
  - 3.12.1 make a pattern
  - 3.12.2 condition the sand
  - 3.12.3 create a mould
  - 3.12.4 heat and pour the molten metal
  - 3.12.5 remove and finish the casting
- 3.13 research a completed casting and check to see that it is clean, free of voids and finished appropriately
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE FAB1130: PRINCIPLES OF MACHINING**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students develop basic hand and machine tool knowledge, skills and techniques to mechanically remove materials.

**Parameters:** Access to a materials work centre, complete with a drill press, bench or pedestal grinder and metal lathe, and to instruction from an individual with specialized training in basic machining.

**Outcomes:** The student will:

### **1. identify and describe common machineable materials and machining processes**

- 1.1 list and describe the principal methods of material removed by:
  - 1.1.1 sawing
  - 1.1.2 shaping
  - 1.1.3 grinding
  - 1.1.4 turning
  - 1.1.5 milling
  - 1.1.6 drilling
  - 1.1.7 buffing
- 1.2 identify common machineable materials; e.g., aluminum, mild steel, brass, plastic
- 1.3 research methods of securing stock for purposes of machining; e.g., chuck, vise, clamp
- 1.4 analyze common hand and machine tool processes of:
  - 1.4.1 cutting and shaping
  - 1.4.2 grinding and polishing
  - 1.4.3 threading metal stock
- 1.5 compare the performance of manually operated and computer-controlled equipment in relation to:
  - 1.5.1 accuracy
  - 1.5.2 repeatability
  - 1.5.3 reliability
  - 1.5.4 productivity
- 1.6 explain how the proper drill speeds and feed rates are determined

### **2. perform safe set-up, operation and shut-down of equipment used in drilling, grinding and turning operations**

- 2.1 list and describe the safety hazards associated with drilling
- 2.2 describe the major components and operation of a metal lathe
- 2.3 list and describe the safety hazards associated with turning
- 2.4 list and describe the safety hazards associated with grinding
- 2.5 demonstrate basic skills in:
  - 2.5.1 measurement and layout
  - 2.5.2 drilling, grinding and turning operations to size, shape and finish a complete product

### **3. demonstrate basic hand and machine tool knowledge, skills and techniques**

- 3.1 describe the current systems of measurement used in machining and explain the advantages and disadvantages of each
- 3.2 list and describe common types of rules, squares, dividers, callipers, micrometers and gauges that are used in connection with machining
- 3.3 identify the major components and describe the operation of a drill press
- 3.4 research the design of a typical twist drill and methods of sizing
- 3.5 describe the purpose and list the types of lubrication that are used when drilling
- 3.6 identify the appropriate cutting tool to face metal stock
- 3.7 explain what is meant by cutting speed, feed rate and depth of cut and how these variables are expressed and controlled
- 3.8 identify the major components and operation of a bench or pedestal grinder
- 3.9 identify and describe different kinds of grinding wheels
- 3.10 explain why it is important not to overheat thin edges or points and not to grind soft metals
- 3.11 identify the types and uses of cloth abrasives
- 3.12 select or modify a product that incorporates:
  - 3.12.1 drilling
  - 3.12.2 grinding
  - 3.12.3 turning operations
- 3.13 describe the machining operations and sequence them in a logical and efficient manner
- 3.14 research a completed product to determine whether it meets the specified tolerances and quality of finish

### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

### **5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE FAB1160: PRODUCTION SYSTEMS**

**Level:** Introductory

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students investigate and compare the principles of production operation and the characteristics of a number of production systems.

**Parameters:** Access to a materials work centre, complete with basic hand and power tools, and to instruction from an individual with specialized training in the use of basic hand and power tools.

**Outcomes:** The student will:

### **1. list and describe common methods of manufacturing durable products**

- 1.1 when selecting a product, explain the importance of:
  - 1.1.1 appeal
  - 1.1.2 ease of manufacture
  - 1.1.3 use of standardized parts
  - 1.1.4 quality
  - 1.1.5 cost
- 1.2 help prepare a flow chart that:
  - 1.2.1 combines the worker, machines and materials in an organized unit
  - 1.2.2 requires minimal movement of the worker and materials
  - 1.2.3 identifies specific operations
- 1.3 explain the importance of providing for:
  - 1.3.1 personal and environmental safety
  - 1.3.2 easy access to utilities
  - 1.3.3 ventilation
  - 1.3.4 lighting
  - 1.3.5 waste disposal
  - 1.3.6 material and product handling
- 1.4 help design jigs, templates and fixtures based on:
  - 1.4.1 ease of use
  - 1.4.2 ability to reduce error
  - 1.4.3 cost and safety
- 1.5 help design, construct and operate a production system
- 1.6 identify when a product is at standard, needs reworking or should be rejected

### **2. demonstrate basic production planning and management skills**

- 2.1 list and describe the following four basic types of manufacturing systems:
  - 2.1.1 custom
  - 2.1.2 job lot
  - 2.1.3 continuous
  - 2.1.4 just-in-time
- 2.2 describe safety rules and guidelines associated with the task and working conditions
- 2.3 identify common hazards associated with the use of a specific tool, machining material or process
- 2.4 inspect for and correct potential hazards within the working environment
- 2.5 describe a safety plan in case of an accident

- 2.6 select a manufacturing system based on the:
  - 2.6.1 number of products to be produced
  - 2.6.2 availability of resources
  - 2.6.3 type of product
  - 2.6.4 life cycle and durability of a product
- 2.7 describe what tools, materials and processes will be required to manufacture the product
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 4.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 4.2 create a connection between a personal inventory and occupational choices



## **COURSE FAB1910: FAB PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE FAB2010: STRUCTURAL ENGINEERING**

**Level:** Intermediate

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students investigate the nature of forces and structural materials and apply their findings to design and fabrication activities.

**Parameters:** Access to a fabrication work centre, complete with basic hand tools.

**Supporting Course:** FAB1100: Fabrication Principles

**Outcomes:** The student will:

### **1. list and describe the principal characteristics of all structures**

- 1.1 through the analysis of natural and fabricated (synthetic) forms, explain how:
  - 1.1.1 structural elements provide both shape and support
  - 1.1.2 structures are built to withstand forces of nature, applied loads and the weights of the structural components
  - 1.1.3 loads applied to a structure generate forces that must be kept in balance
  - 1.1.4 most structures are built with a margin of safety
- 1.2 identify, from natural and synthetic structures, examples of:
  - 1.2.1 frame
  - 1.2.2 shell
  - 1.2.3 non-rigid structures
- 1.3 identify natural and synthetic structural materials that have good:
  - 1.3.1 tensile strength
  - 1.3.2 compressive strength
  - 1.3.3 elasticity
- 1.4 list typical structural components that are used as:
  - 1.4.1 linear elements, such as a beam
  - 1.4.2 vertical elements, such as a column
  - 1.4.3 non-rigid elements, such as a cable
- 1.5 explain the purpose of rigid and non-rigid materials that are used between linear and vertical elements; e.g., plywood and canvas
- 1.6 describe the advantages and disadvantages of non-rigid structures

### **2. identify strategies to improve the efficiency of a structure**

- 2.1 show how triangulation is used to stabilize a truss and rectangular frame
- 2.2 show how internal forces are created to balance external loads
- 2.3 analyze an existing structure and redesign it to increase its efficiency by:
  - 2.3.1 reducing weight yet maintaining strength
  - 2.3.2 enhancing its durability and usefulness
  - 2.3.3 reducing material and construction costs

**3. apply principles of structural design to fabrication and construction activities**

- 3.1 demonstrate the effects of moving a load close to or away from the neutral axis of a beam
- 3.2 compare the connecting limits of adhesive and cohesive materials and rigid fasteners
- 3.3 describe the effects of the following forces on a simple rigid structure:
  - 3.3.1 compression
  - 3.3.2 tension
  - 3.3.3 shear
  - 3.3.4 bending
  - 3.3.5 twisting
- 3.4 demonstrate the effects one element has on another when it fails
- 3.5 fabricate a structure or component using common materials, tools and contemporary design principles
- 3.6 analyze and test a structure or component to determine its:
  - 3.6.1 strength-to-weight ratio
  - 3.6.2 cost efficiency
  - 3.6.3 service and construction limitations

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2020: PRINT READING**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop basic skills in reading and interpreting working drawings to prepare a bill of materials and sequence of operations.

**Parameters:** Access to appropriate print resources and to instruction from an individual with specialized training in print reading.

**Outcomes:** The student will:

### **1. identify and describe the principal components of a print**

- 1.1 describe the types of drawings that are used to visualize an object pictorially and orthographically
- 1.2 identify and describe the types of lines commonly found on a drawing; e.g., object, hidden, centre line, dimension
- 1.3 research dimensioning systems used to identify:
  - 1.3.1 linear dimensions
  - 1.3.2 angular dimensions
  - 1.3.3 limits, fits and tolerance
- 1.4 identify the types of threaded fasteners and methods of representation; e.g., detailed, schematic
- 1.5 identify the types of non-threaded fasteners and methods of representation; e.g., detailed, symbols
- 1.6 explain how prints are used to create a:
  - 1.6.1 bill of materials
  - 1.6.2 cutting list
  - 1.6.3 schedule of operations

### **2. demonstrate basic print reading skills**

- 2.1 identify the symbols used to describe:
  - 2.1.1 types of materials
  - 2.1.2 structural shapes
  - 2.1.3 seams and joints
  - 2.1.4 fabrication processes
- 2.2 read and interpret symbols denoting weld types and structural shapes
- 2.3 match pictorial and orthographic drawings that have:
  - 2.3.1 a surface parallel to the viewing plane
  - 2.3.2 hidden edges or surfaces
  - 2.3.3 inclined and oblique surfaces
  - 2.3.4 curved surfaces and holes
- 2.4 read and interpret multiview prints to determine object sizes, shapes and fabrication specifications
- 2.5 read and interpret the size, type and location of threaded and non-threaded fasteners
- 2.6 prepare a list of materials and sequence of machine/tool operations from a given print
- 2.7 outline the importance of accurate prints and print reading skills to ensure high standards of quality and productivity



**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

**4. identify possible life roles related to the skills and content of this cluster**

- 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 4.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2030: OXYFUEL WELDING**

**Level:** Intermediate

**Prerequisite:** FAB1040: Oxyacetylene Welding

**Description:** Students develop basic skills in the safe and efficient use of oxyfuel equipment and supplies to braze and fusion weld.

**Parameters:** Access to a fabrication work centre, complete with oxyfuel welding equipment and supplies, and to instruction from an individual with formal, specialized training in oxyfuel welding practices.

**Outcomes:** The student will:

- 1. describe the essential differences between braze welding and fusion welding**
  - 1.1 describe the differences between braze welding and fusion welding
  - 1.2 list the advantages and disadvantages of braze welding
  - 1.3 demonstrate basic fusion welding skills in the flat, vertical and horizontal positions
- 2. demonstrate basic braze welding competencies**
  - 2.1 describe health and safety issues such as:
    - 2.1.1 using the appropriate personal protective equipment and clothing
    - 2.1.2 keeping the welding area free of combustible materials
    - 2.1.3 ensuring adequate ventilation, particularly when braze welding
    - 2.1.4 returning and storing all consumables, as directed
    - 2.1.5 locating appropriate fire extinguishers in the event of a fire
  - 2.2 describe the appropriate clearance allowed between parts of a braze weldment
  - 2.3 demonstrate basic skills in braze welding in the flat and horizontal positions
- 3. demonstrate basic oxyfuel weld competencies in the flat, horizontal and vertical positions**
  - 3.1 describe the appropriate moving, storing and set-up procedures
  - 3.2 identify local codes and restrictions related to the use and storage of oxygen and acetylene cylinders
  - 3.3 describe the alternative gases available for heating; their comparative temperatures and applications such as MAPP and propane
  - 3.4 select the correct filler rod and tip size for a given application
  - 3.5 set working gas pressures to match the tip size
  - 3.6 prepare a destructive and non-destructive weld assessment
  - 3.7 research applications of oxyfuel welding
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely

- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2040: THERMAL CUTTING**

**Level:** Intermediate

**Prerequisite:** FAB1040: Oxyacetylene Welding

**Description:** Students develop basic skills to use, safely and efficiently, thermal cutting equipment and supplies.

**Parameters:** Access to a fabrication work centre, complete with thermal cutting equipment, and to instruction from an individual with formal, specialized training in oxyfuel cutting practices.

**Outcomes:** The student will:

**1. take preventive measures to avoid accidents and personal injury to self and others by identifying health and safety hazards associated with thermal cutting**

1.1 identify the workplace labels and precautionary procedures when using:

- 1.1.1 compressed gas
- 1.1.2 flammable materials
- 1.1.3 oxidizing materials
- 1.1.4 electrical equipment

1.2 review a safety plan in case of an accident

1.3 locate the recommended fire extinguisher

1.4 locate and wear the appropriate personal protective equipment

1.5 locate and clear the work station of all combustible materials

**2. identify safe start-up and shut-down cutting procedures**

2.1 describe the correct way to start a cut and pierce a hole

2.2 describe the appropriate method to:

- 2.2.1 start an arc
- 2.2.2 set stand-off distance
- 2.2.3 control the kerf

2.3 describe correct start-up and shut-down procedures

**3. demonstrate basic manual cutting operations**

3.1 describe common metals that can be successfully cut using:

- 3.1.1 oxyfuel
- 3.1.2 air carbon arc
- 3.1.3 shielded metal arc
- 3.1.4 plasma arc processes

3.2 describe the oxyfuel process in relation to:

- 3.2.1 ignition temperature and identification
- 3.2.2 slag and oxide removal

3.3 identify the types of cutting fuels, their operating temperatures and their efficiency ratios

3.4 identify the parts of a cutting torch and their function

3.5 describe the relationship between tip size, metal thickness and gas pressures

3.6 describe the factors controlling tip selection; e.g., depth of cut, type of material, condition of metal, type and quality of cut

- 3.7 describe the plasma arc process in relation to:
  - 3.7.1 arc formation
  - 3.7.2 cutting gas
  - 3.7.3 cooling
  - 3.7.4 dross formation
- 3.8 identify and describe the purpose of the parts of a plasma arc cutting system
- 3.9 list the advantages of using a plasma arc cutting system
- 3.10 select and adjust the appropriate equipment for a given cutting operation
- 3.11 demonstrate the use of oxyfuel equipment to cut straight edges and bevels, curves and holes in mild steel plate
- 3.12 demonstrate the use of plasma arc to cut:
  - 3.12.1 straight and curved cuts
  - 3.12.2 holes in ferrous and non-ferrous metals
- 3.13 demonstrate the safe use of carbon arc gouging equipment
- 3.14 inspect a cut and determine ways to improve the quality of the cut related to the size of the preheating flame, oxygen pressure, cutting speed and different machine settings, gas pressures, and cutting speeds for plasma arc cutting
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE FAB2048: FLUX CORED ARC WELDING 1**

**Level:** Intermediate

**Prerequisite:** FAB1048: Semi-automated/Automated Welding

**Description:** Students develop an understanding of the advantages and disadvantages of Flux Cored Arc Welding (FCAW) processes, and they gain experience using FCAW processes by performing flat, horizontal and vertical fillet welds and flat groove welds.

**Parameters:** Access to a fabrication work centre, complete with FCAW equipment and supplies, and to instruction from an individual with formal, specialized training in arc welding practices.

**Outcomes:** The student will:

- 1. outline the advantages and disadvantages of FCAW processes versus other forms of arc welding processes**
  - 1.1 identify the advantages and disadvantages of FCAW processes as compared with other arc welding processes
  - 1.2 identify the variables that can directly affect weld quality; e.g., the welding current and voltage, modes of metal transfer such as short arc, globular and spray arc, diameter and type of filler metal, type and condition of equipment, welding technique such as forehand or pushing, backhand or pulling
  - 1.3 identify possible causes of welding defects; e.g., surface porosity, subsurface porosity, lack of fusion, burn-through, lack of penetration, cold lapping
  - 1.4 identify problems common to out-of-position welding
- 2. describe the characteristics of a desirable flux cored arc weld**
  - 2.1 complete a visual inspection, i.e., non-destructive test, by observing and assessing:
    - 2.1.1 overall size, shape and appearance of the beads
    - 2.1.2 plate penetration
    - 2.1.3 fusion
    - 2.1.4 degree of undercutting and overlapping
- 3. identify safe set-up and maintenance procedures with FCAW equipment**
  - 3.1 describe and demonstrate the maintenance required for wire drive systems and gun assemblies
- 4. demonstrate safe FCAW practices and perform:**
  - **fillet welds on mild steel plate in the flat, horizontal and vertical positions**
  - **groove welds on mild steel plate in the flat position**
  - 4.1 describe safety issues related to:
    - 4.1.1 using personal protective equipment
    - 4.1.2 handling and storing consumables
    - 4.1.3 keeping the welding area free of hazards
    - 4.1.4 ensuring adequate ventilation
  - 4.2 describe a safety plan in case of an accident
  - 4.3 apply safe work practices and procedures to:
    - 4.3.1 select and use appropriate personal protective equipment
    - 4.3.2 maintain a clean and tidy workstation
    - 4.3.3 demonstrate safe tool/material handling and storage techniques

- 4.4 for a given type of weld and/or weldment, select the appropriate:
  - 4.4.1 wire type, size and feed rate
  - 4.4.2 current
  - 4.4.3 shielding gas type and flow rate
- 4.5 prepare and clean all surfaces to be welded
- 4.6 properly position metal for welding
- 4.7 demonstrate safe FCAW techniques and perform fillet welds in the flat, horizontal and vertical positions on mild steel plate
- 4.8 demonstrate safe FCAW techniques and perform groove welds in the flat position on mild steel plate
- 4.9 perform a destructive test, where appropriate

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2050: ARC WELDING 1**

**Level:** Intermediate

**Prerequisite:** FAB1050: Basic Electric Welding

**Description:** Students develop basic knowledge, skills and attitudes related to the operation and use of Shielded Metal Arc Welding (SMAW) equipment and accessories to make a variety of welds in the flat position.

**Parameters:** Access to a fabrication work centre, complete with SMAW equipment and supplies, and to instruction from an individual with formal, specialized training in arc welding practices.

**Outcomes:** The student will:

- 1. identify the appropriate treatment for minor injuries associated with welding processes**
  - 1.1 demonstrate and describe the procedures for administering first aid for minor cuts, burns and bruises
  - 1.2 explain the effects of arc flash and the suggested treatment
  - 1.3 describe the effects of inadequate ventilation and the suggested treatment
- 2. describe the visual characteristics of a desirable weld**
  - 2.1 identify the attributes of a quality weld
  - 2.2 inspect a weld by considering the overall appearance, size and shape of the beads, plate penetration, fusion, undercutting and overlapping
- 3. demonstrate basic SMAW competencies in the flat position**
  - 3.1 demonstrate knowledge of the following electrical terms:
    - 3.1.1 direct current
    - 3.1.2 alternating current
    - 3.1.3 voltage
    - 3.1.4 amperage
    - 3.1.5 resistance
    - 3.1.6 polarity
    - 3.1.7 open circuit voltage and arc voltage
  - 3.2 compare the operation and current output produced by a:
    - 3.2.1 transformer
    - 3.2.2 rectifier
    - 3.2.3 generator
  - 3.3 explain the meaning of duty cycle
  - 3.4 describe the construction and sizing of cables
  - 3.5 compare the different types of electrode holders and maintenance requirements
  - 3.6 identify the types and uses of cable lugs, quick connectors and work clamps
  - 3.7 describe and demonstrate the accepted methods of striking an arc
  - 3.8 describe the difference between a stringer bead and a weave bead
  - 3.9 describe and demonstrate the proper tacking procedures and weld profile for a flat fillet weld
  - 3.10 adjust the equipment to coincide with the type of electrode, type of weld and metal thickness
  - 3.11 lay a consistent and even stringer bead and/or weave bead in the flat position
  - 3.12 run a series of stringer beads in the flat position to create a layer of weld metal
  - 3.13 make lap and square butt welds on mild steel plate in the flat position

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE FAB2060: ARC WELDING 2**

**Level:** Intermediate

**Prerequisite:** FAB2050: Arc Welding 1

**Description:** Students identify appropriate electrodes by visually assessing a weld and making the necessary adjustments to improve weld quality while developing horizontal position welding skills.

**Parameters:** Access to a fabrication work centre, complete with Shielded Metal Arc Welding (SMAW) equipment and supplies, and to instruction from an individual with formal, specialized training in arc welding practices.

**Outcomes:** The student will:

- 1. explain the current systems used to classify electrodes in Canada and the United States**
  - 1.1 describe the purpose of the core wire and electrode coating
  - 1.2 identify the characteristics of an electrode using American Welding Society (AWS) and Canadian Standards Association (CSA) codes
  - 1.3 show the relationship between metal thickness, electrode size and welding amperage
  - 1.4 describe the electrode(s) that can be used for a given application by considering:
    - 1.4.1 properties of the base metal
    - 1.4.2 weld position
    - 1.4.3 flux requirements
    - 1.4.4 material thickness
    - 1.4.5 static and dynamic load characteristics
- 2. identify strategies to assess and improve weld quality**
  - 2.1 compare straight and reverse polarity and the resulting heat distribution
  - 2.2 describe the advantages and disadvantages of using alternating and direct current
  - 2.3 describe the effects of a short and long arc on mild steel
  - 2.4 describe the effects of improper:
    - 2.4.1 amperage setting
    - 2.4.2 arc length
    - 2.4.3 travel speed
  - 2.5 explain the importance of removing the following from a joint before welding:
    - 2.5.1 oil
    - 2.5.2 paint
    - 2.5.3 rust
    - 2.5.4 mill scale
  - 2.6 inspect a weld by considering the overall appearance, size and shape of the beads, plate penetration, fusion and degree of undercutting and overlapping
- 3. demonstrate basic SMAW competencies in the horizontal position**
  - 3.1 use the appropriate electrode and machine setting to make single and multiple pass fillet in the horizontal position and groove welds in the flat position



**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2070: GAS METAL ARC WELDING 1**

**Level:** Intermediate

**Prerequisite:** FAB1048: Semi-automated/Automated Welding

**Description:** Students develop an understanding of the advantages and disadvantages of Gas Metal Arc Welding (GMAW) processes, and they gain experience using GMAW processes by performing flat, horizontal and vertical fillet welds and flat groove welds.

**Parameters:** Access to a fabrication work centre, complete with GMAW equipment and supplies, and to instruction from an individual with formal, specialized training in arc welding practices.

**Outcomes:** The student will:

- 1. outline the advantages and disadvantages of GMAW processes versus other forms of arc welding processes**
  - 1.1 identify the advantages and disadvantages of GMAW processes as compared with other arc welding processes
  - 1.2 identify the variables that can directly affect weld quality; e.g., the welding current and voltage, modes of metal transfer such as short arc, globular and spray arc, diameter and type of filler metal, type and condition of equipment, welding technique such as forehand or pushing, backhand or pulling
  - 1.3 identify possible causes of welding defects; e.g., surface porosity, subsurface porosity, lack of fusion, burn-through, lack of penetration, cold lapping
  - 1.4 identify problems common to out-of-position welding
- 2. describe the characteristics of a desirable GMAW**
  - 2.1 complete a visual inspection, i.e., non-destructive test, by observing and assessing:
    - 2.1.1 overall size, shape and appearance of the beads
    - 2.1.2 plate penetration
    - 2.1.3 fusion
    - 2.1.4 degree of undercutting and overlapping
  - 2.2 perform a destructive test, where appropriate
- 3. identify safe set-up and maintenance procedures with GMAW equipment**
  - 3.1 apply safe work practices and procedures to:
    - 3.1.1 select and use appropriate personal protective equipment
    - 3.1.2 maintain a clean and tidy workstation
    - 3.1.3 demonstrate safe tool/material handling and storage techniques
  - 3.2 for a given type of weld and/or weldment, select the appropriate:
    - 3.2.1 wire type, size and feed rate
    - 3.2.2 current
    - 3.2.3 shielding gas type and flow rate
  - 3.3 describe and demonstrate the maintenance required for wire drive systems and gun assemblies

**4. demonstrate safe GMAW practices to perform:**

- **fillet welds on mild steel plate in the flat, horizontal and vertical positions**
- **groove welds on mild steel plate in the flat position**

4.1 describe safety issues related to:

- 4.1.1 using personal protective equipment
- 4.1.2 handling and storing consumables
- 4.1.3 keeping the welding area free of hazards
- 4.1.4 ensuring adequate ventilation

4.2 describe a safety plan in case of an accident

4.3 prepare and clean all surfaces to be welded

4.4 properly position metal for welding

4.5 demonstrate safe GMAW techniques and perform fillet welds in the flat, horizontal and vertical positions on mild steel plate

4.6 demonstrate safe GMAW techniques and perform groove welds in the flat position on mild steel plate

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

6.1 recognize and then analyze the opportunities and barriers in the immediate environment

6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2090: SHEET FABRICATION 2 (MACHINE PROCESSES)**

**Level:** Intermediate

**Prerequisite:** FAB1090: Sheet Fabrication 1 (Hand Processes)

**Description:** Students use basic layout, cutting, bending and fastening operations to transform common types of sheet metals into consumer products.

**Parameters:** Access to a fabrication work centre, complete with basic sheet metal cutting, forming and fastening tools, and to instruction from an individual with specialized training in sheet metal practices.

**Outcomes:** The student will:

- 1. identify and describe common types of stock sheet metal materials and related tools**
  - 1.1 identify common samples of sheet metal stock by their appearance and properties
  - 1.2 explain how sheet metal thicknesses are measured and stated
  - 1.3 explain the safe use of hand and machine tools to make internal and external cuts that are:
    - 1.3.1 straight
    - 1.3.2 curved
  - 1.4 explain the safe use of hand and machine tools to form a product
- 2. demonstrate approved materials handling and storage practices**
  - 2.1 describe the most appropriate way to safely handle and store metal stock
- 3. perform basic sheet metal fabrication skills and practices to produce a product**
  - 3.1 describe and give examples of uses for:
    - 3.1.1 flange/butt
    - 3.1.2 lap
    - 3.1.3 folded
    - 3.1.4 grooved seams
  - 3.2 calculate the appropriate hem and seam allowances for a given product
  - 3.3 describe the advantages and disadvantages of:
    - 3.3.1 tinner's rivets
    - 3.3.2 pop rivets
  - 3.4 identify the common sizes and types of metal fastening screws and bolts
  - 3.5 identify appropriate conditions and techniques to solder or weld a seam
  - 3.6 calculate and mark the sequence and direction of all bends
  - 3.7 demonstrate basic sheet metal process and fabrication skills related to the following procedures:
    - 3.7.1 layout
    - 3.7.2 cutting
    - 3.7.3 bending
    - 3.7.4 fastening
  - 3.8 inspect a completed rectangular product for the overall attention to:
    - 3.8.1 fit of seams
    - 3.8.2 accuracy of measurement
    - 3.8.3 structural soundness
    - 3.8.4 quality of finish
  - 3.9 research common finishing techniques

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE FAB2100: SHEET FABRICATION 3 (PARALLEL LINE)**

**Level:** Intermediate

**Prerequisite:** FAB2090: Sheet Fabrication 2 (Machine Processes)

**Description:** Students expand sheet metal skills related to pattern making, seam constructing and edge treating.

**Parameters:** Access to a fabrication work centre, complete with basic sheet forming and fastening tools, and to instruction from an individual with specialized training in sheet metal practices.

**Outcomes:** The student will:

**1. describe and give examples of parallel line developments**

1.1 list and describe the following pattern developments:

- 1.1.1 parallel line
- 1.1.2 radial line
- 1.1.3 triangulations

**2. create a parallel line development, using standard drawing and layout practices**

2.1 prepare a parallel line development

2.2 create a systematic sequence of operations to fabricate a parallel line product

2.3 identify and describe the purpose of a:

- 2.3.1 standing edge
- 2.3.2 single hem
- 2.3.3 double hem
- 2.3.4 wired edge

2.4 describe how to calculate the material allowance for a wire edge

2.5 explain the use of the following patterns:

- 2.5.1 full
- 2.5.2 half
- 2.5.3 pierced

2.6 identify and describe the use of the following seams:

- 2.6.1 plain lap and flush lap
- 2.6.2 inside and outside lap
- 2.6.3 single and double seam
- 2.6.4 grooved joint
- 2.6.5 Pittsburgh lock

2.7 calculate the material allowance for a:

- 2.7.1 double and a single seam
- 2.7.2 Pittsburgh lock

**3. apply sheet metal fabrication principles and skills to fabricate a product, using parallel line development**

3.1 explain how to provide adequate air quality for welding, soldering and finishing

3.2 describe:

- 3.2.1 the use of appropriate personal protective equipment
- 3.2.2 proper storage of consumables
- 3.2.3 a safety plan in case of an accident

- 3.3 explain how and when to use:
  - 3.3.1 combination, straight and aviation snips
  - 3.3.2 notchers
  - 3.3.3 squaring shears
- 3.4 explain how to sweat solder lap, single- and double-seamed joints
- 3.5 explain when it is appropriate to use:
  - 3.5.1 spot welders
  - 3.5.2 solid rivets
  - 3.5.3 pop rivets
- 3.6 describe how to forge and tin solder coppers
- 3.7 select the appropriate flux for ferrous and non-ferrous applications
- 3.8 demonstrate basic sheet metal process and fabrication skills related to specific seam and edge treatments and fastening techniques
- 3.9 list criteria to assess a sheet metal product and apply it to the evaluation of a completed product
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2110: FORGING FUNDAMENTALS**

**Level:** Intermediate

**Prerequisite:** FAB1110: Bar & Tubular Fabrication

**Description:** Students determine the effects of heating and striking metal to change its shape and internal structure, using forging techniques.

**Parameters:** Access to a fabrication work centre, complete with heating and forging equipment, and to instruction from an individual with specialized training in forging practices.

**Supporting Course:** FAB1100: Fabrication Principles

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by identifying health and safety hazards associated with metal forging**
  - 1.1 identify the appropriate personal protective equipment used in forging
  - 1.2 describe the approved start-up and shut-down procedures for a given forge
  - 1.3 create a sequence of forging operations by analyzing an existing forged part or shop drawing
- 2. identify and describe the basic tools and processes used in forging**
  - 2.1 identify common and machine parts that are made by forging
  - 2.2 identify and describe the types of hand tools that are used in forging
  - 2.3 describe the use of:
    - 2.3.1 hammers
    - 2.3.2 tongs
    - 2.3.3 sets
    - 2.3.4 fullers
    - 2.3.5 punches
    - 2.3.6 swages
  - 2.4 describe the parts of a solid fuel or gas-fired forge
  - 2.5 explain how temperatures are controlled
  - 2.6 describe the chemical reactions that take place between the heating elements and the work piece
  - 2.7 describe how the combination of heating and quenching can be used to control the shaping of the metal
  - 2.8 describe the processes of hardening, tempering, annealing and normalizing related to forging
  - 2.9 compare the process of drop forging with those of conventional forging techniques
- 3. demonstrate basic metal forging skills and practices**
  - 3.1 compare the grain structure of a part shaped by forging with one shaped by casting or machining
  - 3.2 observe and note the processes of:
    - 3.2.1 tapering
    - 3.2.2 drawing out
    - 3.2.3 bending
    - 3.2.4 twisting
    - 3.2.5 upsetting
  - 3.3 demonstrate basic forging skills using a variety of forging tools

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2120: FOUNDRY 2 (SPLIT PATTERN)**

**Level:** Intermediate

**Prerequisite:** FAB1120: Foundry 1 (One-piece Pattern)

**Description:** Students expand their pattern making and foundry skills to produce split pattern moulds and finished castings.

**Parameters:** Access to a fabrication work centre, complete with foundry equipment and supplies, and to instruction from an individual with specialized training in foundry practices.

**Outcomes:** The student will:

- 1. describe the essential similarities and differences between a one-piece pattern and a split pattern**
  - 1.1 from a selection of cast objects, list those made from two-part patterns and identify the parting line on each casting
  - 1.2 describe the type of pattern used to make a mould for cylindrical/spherical objects
  - 1.3 explain how a split pattern is aligned and why this is necessary
  - 1.4 compare the shrinkage allowances for:
    - 1.4.1 aluminum
    - 1.4.2 brass
    - 1.4.3 cast iron
  - 1.5 explain how the two parts of the mould are aligned correctly
- 2. describe safe start-up and shut-down procedures for the operation of a foundry furnace**
  - 2.1 identify safe start-up and shut-down procedures for a given furnace
  - 2.2 identify appropriate fluxes to be used with the melting process
  - 2.3 identify the dangers related to:
    - 2.3.1 handling ceramic crucibles
    - 2.3.2 moisture in contact with molten metal
    - 2.3.3 metals splashing
    - 2.3.4 moulds incorrectly vented
    - 2.3.5 metal escape if mating flask surfaces are damaged
    - 2.3.6 water as a sand binder
    - 2.3.7 fumes from metal, fluxing and binders
  - 2.4 identify common foundry practices to avoid injury in all of the above
- 3. demonstrate basic pattern making skills to make a split pattern**
  - 3.1 list and describe common foundry furnaces and accessories
  - 3.2 describe the correct use of foundry tools and equipment to make a mould from a two-part pattern
  - 3.3 describe the correct pouring temperature for both aluminum alloy and lead-based alloys
  - 3.4 describe a safety plan in case of an accident
- 4. apply sand casting principles and skills to make a casting from a split pattern**
  - 4.1 use the appropriate tools, materials and processes to:
    - 4.1.1 construct a split pattern
    - 4.1.2 create a sand mould
    - 4.1.3 pour



- 4.1.4 cool
- 4.1.5 remove flash, gates and runners
- 4.1.6 finish a sand casting
- 4.2 identify the cause of porosity in a casting and take appropriate measures to correct the problem
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2130: PRECISION TURNING 1**

**Level:** Intermediate

**Prerequisite:** FAB1130: Principles of Machining

**Description:** Students develop basic turning skills to size, shape and finish common machineable metals and plastics.

**Parameters:** Access to a fabrication work centre, complete with a metal lathe and accessories, and to instruction from an individual with specialized training in machining practices.

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by identifying health and safety hazards specific to metal turning**
  - 1.1 describe safety procedures related to the use and operation of metal turning equipment
  - 1.2 identify and correct common hazards related to machine lathe and turning processes
  - 1.3 describe a safety plan in case of an accident
  - 1.4 compare the machining characteristics of common ferrous and non-ferrous materials
- 2. identify safe metal lathe set-up, operation and shut-down procedures**
  - 2.1 describe the basic parts and accessories of an engine lathe
  - 2.2 explain the difference between a three- and a four-jaw chuck
  - 2.3 identify cutting and forming tools that are used for:
    - 2.3.1 roughing
    - 2.3.2 facing
    - 2.3.3 drilling
    - 2.3.4 boring
    - 2.3.5 parting
    - 2.3.6 knurling
    - 2.3.7 finishing
  - 2.4 describe the correct procedures to:
    - 2.4.1 mount work in a three- and/or four-jaw chuck
    - 2.4.2 mount work between centres
  - 2.5 describe set-up procedures to face, centre drill, straight turn and drill stock
  - 2.6 describe the factors that affect spindle speed, feed rate and depth of cut
  - 2.7 describe safe finishing techniques when using files and abrasives
  - 2.8 identify and describe lathe and lathe tool lubricants and coolants
- 3. demonstrate basic straight turning and finishing skills**
  - 3.1 from a machine drawing of a turned part identify:
    - 3.1.1 overall dimension
    - 3.1.2 types of materials
    - 3.1.3 types of finishes
    - 3.1.4 fits and tolerances
  - 3.2 list and describe the machining operations in a logical order
  - 3.3 calculate the appropriate cutting speeds, feed rates and depth of cuts for rough turning, finishing, drilling and knurling different materials

- 3.4 demonstrate basic turning skills related to the following for common machineable metals and/or plastics:
  - 3.4.1 facing
  - 3.4.2 centre drilling
  - 3.4.3 straight turning
  - 3.4.4 drilling
  - 3.4.5 boring
  - 3.4.6 knurling
  - 3.4.7 parting
  - 3.4.8 finishing
- 3.5 research ways to improve output quality and reduce machining time
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2140: PRECISION MILLING 1**

**Level:** Intermediate

**Prerequisite:** FAB1130: Principles of Machining

**Description:** Students develop basic milling skills to shape and finish common machineable metals and plastics.

**Parameters:** Access to a fabrication work centre, complete with a vertical and/or a horizontal mill and accessories, and to instruction from an individual with specialized training in machining practices.

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by identifying health and safety hazards specific to milling operations**
  - 1.1 observe all safety procedures related to the use and operation of metal milling equipment
  - 1.2 describe a safety plan in case of an accident
- 2. identify safe milling machine set-up, operation and shut-down procedures**
  - 2.1 research typical set-up procedures for horizontal and/or vertical milling to create flat surfaces, grooves and chamfers
  - 2.2 compare the operation and uses of a vertical mill with the operation and uses of a horizontal mill
  - 2.3 identify and describe the types of cutters used in vertical and horizontal milling according to their size, construction and purpose; e.g., plain milling, side milling, end milling cutters
  - 2.4 use the recommended lubricants for a given milling machine
  - 2.5 identify the purpose of a cutting fluid and identify common types
  - 2.6 identify the factors that determine cutting speeds, feed rates and depths of cuts
  - 2.7 explain the advantages and disadvantages of upcutting and climb milling
- 3. demonstrate basic milling machine skills and practices**
  - 3.1 identify and describe the basic parts and accessories of a milling machine
  - 3.2 identify, from a machine drawing of a milled part, the:
    - 3.2.1 overall dimensions and tolerance
    - 3.2.2 quality of surface finish
    - 3.2.3 most appropriate milling machine and cutters to be used
  - 3.3 list and describe the machining operations to square stock, bevel and chamfer surfaces
  - 3.4 calculate the appropriate cutting speeds, feed rates and depth of cuts for a specific operation
  - 3.5 demonstrate basic competencies using a milling machine to rough size, square, bevel, chamfer and finish machine parts to the prescribed tolerances and specification
  - 3.6 research ways to improve output quality and machining time
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE FAB2150: CNC TURNING (COMPUTER NUMERICAL CONTROL)**

**Level:** Intermediate

**Prerequisite:** FAB1130: Principles of Machining

**Description:** Students develop skills in computer-assisted design (CAD) and computer numerical control (CNC) programming to manufacture a product on a CNC lathe.

**Parameters:** Access to a fabrication work centre, complete with a CNC turning centre, and to instruction from an individual with specialized training in CNC practices.

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by identifying safety hazards associated with CNC equipment**
  - 1.1 describe the safety features that are built into the CNC equipment
  - 1.2 describe the:
    - 1.2.1 appropriate use of protective equipment and clothing
    - 1.2.2 need to keep the work area clean and free of hazards
    - 1.2.3 importance of following the manufacturer's instructions and keeping all guards in place and in working order
  - 1.3 describe a safety plan in case of an accident
- 2. demonstrate two-dimensional programming and/or CAD skills**
  - 2.1 identify the relationship of the x and y axis on a metal lathe
  - 2.2 explain how to program a lathe using absolute coordinates
  - 2.3 compare the advantages of using incremental and absolute systems of measurements
  - 2.4 explain the difference between using a fixed zero and full floating zero
  - 2.5 describe the purpose of G and M codes
  - 2.6 explain how canned cycles are used in programming
  - 2.7 explain how a CAD file can be converted to a machineable part file
- 3. apply CNC programming skills to manufacture a turned part**
  - 3.1 describe the principles of machining and the operation of a metal lathe
  - 3.2 analyze a CNC lathe and describe how turning speeds and feed rates are controlled; tools and work pieces are mounted
  - 3.3 identify the turning capabilities of a lathe; e.g., types of materials, set-ups, cutting tools
  - 3.4 prepare a program from a print using absolute coordinates and/or produce a CAD design
  - 3.5 simulate the tool path using computer graphics
  - 3.6 load the program or convert a CAD file
  - 3.7 identify reference and clearance points
  - 3.8 mount and secure the work piece
  - 3.9 mount and set cutting tool(s)
  - 3.10 complete a test run
  - 3.11 manufacture the part
  - 3.12 inspect the part to see that it meets the print dimensions, tolerances and specifications

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2160: CUSTOM FABRICATION**

**Level:** Intermediate

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students work independently, or in a cooperative learning environment, to plan and construct a product/structure that meets a specific client's needs.

**Parameters:** Access to fabrication facilities and equipment and to instruction from an individual with trade qualifications if students are involved in customer work related to welding and other trade-related activities.

**Supporting Course:** FAB1160: Production Systems

**Outcomes:** The student will:

- 1. demonstrate appropriate communicating and planning skills**
  - 1.1 list the steps to follow in determining a customer's needs
  - 1.2 identify the product/structure specifications through consultation with the customer
  - 1.3 create a suitable design, time line and budget by working collaboratively with the customer
  - 1.4 explain to the customer any need to make changes
  - 1.5 complete change orders the customer sees as necessary
  - 1.6 complete a customer satisfaction follow-up
  - 1.7 explain whether any specialized equipment will be needed to complete the task
  - 1.8 describe any unique finishing and installation requirements
  - 1.9 describe the advantages and disadvantages of custom production
- 2. demonstrate effective resource management skills and practices**
  - 2.1 identify and describe key management elements such as:
    - 2.1.1 organizing
    - 2.1.2 designing
    - 2.1.3 producing
    - 2.1.4 controlling
  - 2.2 explain the need to:
    - 2.2.1 identify group and individual responsibilities
    - 2.2.2 identify and capitalize on individual strengths
    - 2.2.3 participate in group as well as self-evaluative processes
    - 2.2.4 develop strategies for positive criticism
  - 2.3 explain a method to gain new leads
  - 2.4 research ways to determine customer satisfaction
- 3. demonstrate custom fabrication competencies**
  - 3.1 describe the advantages and disadvantages of custom production
  - 3.2 identify the types and properties of the materials to be used
  - 3.3 evaluate the need to construct special jigs or fixtures
  - 3.4 complete responsibilities to:
    - 3.4.1 break out materials according to a prearranged plan
    - 3.4.2 process materials with a minimum number of set-ups
    - 3.4.3 assemble, finish and prepare the product/structure for delivery or installation
  - 3.5 identify future service requirements

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2170: PIPE FITTING**

**Level:** Intermediate

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students learn about the uses of pipes, basic piping principles and fabrication skills.

**Parameters:** Access to a fabrication work centre, complete with cutting, threading and assembly tools, and to instruction from an individual with specialized training in pipe cutting and fitting practices.

**Supporting Course:** FAB1110: Bar & Tubular Fabrication

**Outcomes:** The student will:

### **1. identify and describe common pipe fitting materials and applications**

- 1.1 research and describe the types of piping systems used to provide:
  - 1.1.1 gas supply systems
  - 1.1.2 sprinkler systems
  - 1.1.3 hot water and heating services
  - 1.1.4 steam and superheated steam
  - 1.1.5 cooling systems
  - 1.1.6 petroleum and chemical products
- 1.2 identify and provide applications for:
  - 1.2.1 standard pipe (black and galvanized)
  - 1.2.2 thin wall pipe
  - 1.2.3 extra strong pipe
- 1.3 research and give examples of how common piping materials are coded and specified
- 1.4 list and describe the following components found in piping systems:
  - 1.4.1 flanges and fittings
  - 1.4.2 valves
  - 1.4.3 traps
  - 1.4.4 pumps
- 1.5 describe the appropriate type and size of pipe, fittings and components for a given drawing
- 1.6 calculate the length of a given offset

### **2. demonstrate approved methods of joining common types of pipes and materials**

- 2.1 describe appropriate applications and methods of joining pipe by:
  - 2.1.1 threading
  - 2.1.2 welding
  - 2.1.3 using mechanical fasteners
- 2.2 describe how to join dissimilar pipe materials; e.g., steel pipe to copper, steel pipe to plastic
- 2.3 analyze various methods to measure pipe lengths and calculate offsets
- 2.4 identify appropriate methods of laying, hanging and securing pipe



- 2.5 identify all safety procedures related to:
  - 2.5.1 using personal protective clothing
  - 2.5.2 lifting heavy weights
  - 2.5.3 using ladders and scaffolds
  - 2.5.4 using tools and materials
- 2.6 describe a safety plan in case of an accident
- 2.7 use the appropriate tools to make a small pipe assembly that incorporates a variety of fittings and components
- 2.8 test a simple pipe assembly for:
  - 2.8.1 accuracy
  - 2.8.2 tightness of joints
  - 2.8.3 overall workmanship
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. identify possible life roles related to the skills and content of this cluster**
  - 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 4.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2910: FAB PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE FAB2920: FAB PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE FAB3010: MATERIALS TESTING**

**Level:** Advanced

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students are introduced to the principles of materials testing and to the development and evaluation of a mechanical materials test.

**Parameters:** Access to common hand and power assisted tools and to instruction from an individual with specialized training in materials testing.

**Supporting Courses:** FAB1100: Fabrication Principles  
DES1020: The Design Process

**Outcomes:** The student will:

- 1. describe the purpose and nature of materials testing**
  - 1.1 identify and describe common methods of testing materials; e.g., non-destructive, destructive
  - 1.2 explain how test results are recorded and communicate a plan showing how to anticipate the results of a test
  - 1.3 identify common hazards associated with the use of a specific tool, material and/or process
  - 1.4 identify and correct potential hazards within the working environment
  - 1.5 describe a safety plan in case of an accident
- 2. apply testing principles to construct or use a piece of materials testing apparatus**
  - 2.1 design a piece of testing apparatus or test procedure
  - 2.2 create safety controls
  - 2.3 construct testing devices
  - 2.4 identify type of test, calibration and data recovery
  - 2.5 prepare the materials, as required
- 3. test and compare the properties of common materials used in construction and fabrication**
  - 3.1 conduct a given test on a variety of materials and record the test results
  - 3.2 analyze an existing piece of test equipment and describe its:
    - 3.2.1 purpose
    - 3.2.2 operation
    - 3.2.3 method of calibration and data recovery
  - 3.3 compare the data obtained from the materials tested to anticipated results
  - 3.4 explain the reliability of the testing procedure
  - 3.5 identify the advantages/disadvantages of the test being carried out
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE FAB3020: METALLURGY FUNDAMENTALS**

**Level:** Advanced

**Prerequisite:** FAB1010: Fabrication Tools & Materials

**Description:** Students develop fundamental understanding and skills related to metallurgy and apply these skills to fabrication processes.

**Parameters:** Access to a fabrication work centre, complete with heat treating equipment, and to instruction from an individual with specialized training in heat treating practices.

**Supporting Course:** FAB3010: Materials Testing

**Outcomes:** The student will:

- 1. identify and describe the fundamental principles of metallurgy and its industrial applications**
  - 1.1 list and describe the three major fields of metallurgy; i.e., extractive, mechanical, physical
  - 1.2 explain how the principles of metallurgy are used in:
    - 1.2.1 welding
    - 1.2.2 foundry
    - 1.2.3 mechanically forming and finishing metals
  - 1.3 explain the relationship between the properties of a metal and its structure
  - 1.4 describe the effects of adding greater or lesser percentages of carbon to the strength, hardness and brittleness of steel
  - 1.5 describe the effects of cooling on the size and shape of a crystal
- 2. identify the basic alloy components and properties of common alloys**
  - 2.1 use terms to describe the internal structure of metals; e.g., atomic structure, compound, solution, crystal
  - 2.2 compare the effects of heating and cooling on steel with varying carbon contents
  - 2.3 identify elements that are dissolved together to form common alloys including:
    - 2.3.1 steel
    - 2.3.2 bronze
    - 2.3.3 brass
    - 2.3.4 aluminum
  - 2.4 identify the basic alloy components and common uses of the following steel types:
    - 2.4.1 carbon
    - 2.4.2 alloy
    - 2.4.3 tool
    - 2.4.4 stainless
  - 2.5 describe common methods of identifying ferrous and non-ferrous materials such as spark, magnetic and specific gravity tests
  - 2.6 describe the electrochemical nature of corrosion
  - 2.7 identify common methods of reducing corrosion; e.g., protective coating, oxide layers, alloys

- 3. apply metallurgical principles, skills and processes to heat treat a component or product**
  - 3.1 describe the process and purpose of:
    - 3.1.1 quenching
    - 3.1.2 normalizing
    - 3.1.3 annealing
    - 3.1.4 tempering
    - 3.1.5 surface hardening
  - 3.2 explain how heat treating principles are applied to welding and other fabrication processes
  - 3.3 explain how cold working differs from heat treating
  - 3.4 determine the procedures and critical temperatures to heat treat one or more of the following tools:
    - 3.4.1 wood chisel
    - 3.4.2 screwdriver
    - 3.4.3 centre punch
    - 3.4.4 cold chisel
  - 3.5 describe the safe start-up and shut-down procedures of a heat treating furnace
  - 3.6 use the appropriate materials, processes and tools to fabricate and condition a new product or make repairs on an existing product
  - 3.7 research ways to test a product for hardness and toughness
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE FAB3030: GAS TUNGSTEN ARC WELDING**

**Level:** Advanced

**Prerequisite:** FAB2030: Oxyfuel Welding

**Description:** Students develop basic knowledge and skills related to the use of Gas Tungsten Arc Welding (GTAW) equipment and supplies to weld mild steel in the flat and horizontal positions.

**Parameters:** Access to a welding facility, complete with GTAW equipment and supplies, and to instruction from an individual with welding trade qualifications.

**Supporting Courses:** FAB2060: Arc Welding 2  
FAB2070: Gas Metal Arc Welding 1

**Outcomes:** The student will:

- 1. take preventive measures to avoid accidents and personal injury to self and others by identifying health and safety hazards associated with GTAW**
  - 1.1 identify and describe the health and safety issues associated with GTAW, including:
    - 1.1.1 electric current
    - 1.1.2 inert gases
    - 1.1.3 arc radiation
    - 1.1.4 ventilation
  - 1.2 describe a safety plan in case of an accident
- 2. outline the advantages of GTAW over other forms of welding**
  - 2.1 describe the basic components and operating principles of GTAW
  - 2.2 identify the advantages of GTAW over other forms of arc welding
  - 2.3 describe the major types of power supplies and current outputs; e.g., high frequency current, alternating current (AC), direct current straight polarity (DCSP), direct current reverse polarity (DCRP)
- 3. demonstrate basic GTAW competencies in the flat and horizontal positions**
  - 3.1 identify the appropriate type of current used for welding:
    - 3.1.1 low carbon steel
    - 3.1.2 aluminium
    - 3.1.3 stainless steel
  - 3.2 explain the purpose of a shielding gas
  - 3.3 identify the appropriate type of gas to be used with:
    - 3.3.1 low carbon steel
    - 3.3.2 aluminium
    - 3.3.3 stainless steel
  - 3.4 select, prepare and install the appropriate electrode for:
    - 3.4.1 AC
    - 3.4.2 DCSP or direct current electrode negative (DCEN) welding
    - 3.4.3 DCRP or direct current electrode positive (DCEP) welding
  - 3.5 identify and demonstrate the appropriate start-up and shut-down procedures for welding mild steel
  - 3.6 show that mill scale, rust, paint or oil has been removed from the weldments



- 3.7 list the characteristics of a weld that meets trade standards
- 3.8 demonstrate proper handling techniques to prevent weld contamination
- 3.9 identify the degreasers that are commonly used to clean filler materials
- 3.10 describe the correct torch angle for a lap and groove weld in the flat, horizontal and vertical positions
- 3.11 make lap and groove welds in the flat, horizontal and vertical positions
- 3.12 perform a visual inspection of a weld and describe its characteristics
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE FAB3040: SPECIALIZED WELDING**

**Level:** Advanced

**Prerequisite:** FAB2030: Oxyfuel Welding

**Description:** Students develop specific skills associated with advanced welding techniques to join and repair metals other than low carbon steel.

**Parameters:** Access to a welding facility, complete with advanced level welding equipment and supplies, and to instruction from an individual with welding trade qualifications.

**Supporting Courses:** FAB3030: Gas Tungsten Arc Welding  
FAB3050: Arc Welding 3  
FAB3170: Gas Metal Arc Welding 2

**Outcomes:** The student will:

- 1. list specific health and safety hazards associated with welding metals other than low carbon steels, and take preventive measures to avoid accidents and personal injury to self and others**
  - 1.1 describe the health hazards connected with welding metals containing zinc, cadmium, lead, tin and chromium
  - 1.2 describe a safety plan in case of an accident
- 2. describe the unique welding characteristics of weldable metals other than low carbon steel**
  - 2.1 research and describe the unique welding characteristics of:
    - 2.1.1 stainless steel
    - 2.1.2 cast iron
    - 2.1.3 aluminum
    - 2.1.4 white metal (zinc die cast metal)
- 3. select appropriate filler material and welding process to weld a metal other than low carbon steel**
  - 3.1 identify a suitable filler metal and flux to join or repair:
    - 3.1.1 stainless steel
    - 3.1.2 cast iron
    - 3.1.3 aluminum
    - 3.1.4 white metal (zinc die cast metal)
  - 3.2 identify the appropriate joint preparation, supports and techniques for a given metal
  - 3.3 perform a weld or repair on one or more metals other than a low carbon steel
  - 3.4 complete a visual inspection by considering the overall appearance, size and shape of the beads and degree of penetration
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE FAB3048: FLUX CORED ARC WELDING 2**

**Level:** Advanced

**Prerequisite:** FAB2048: Flux Cored Arc Welding 1

**Description:** Students develop skills to evaluate and improve the quality of Flux Cored Arc Welding (FCAW), and they extend their FCAW skills by performing horizontal and vertical groove welds.

**Parameters:** Access to a fabrication work centre, complete with FCAW equipment and supplies, and to instruction from an individual with welding trade qualifications.

**Outcomes:** The student will:

- 1. identify variables that affect the quality of flux core arc welds and identify strategies to evaluate and improve weld quality**
  - 1.1 identify the variables that can directly affect weld quality including the:
    - 1.1.1 welding current and voltage
    - 1.1.2 type of shielding gas/flux
    - 1.1.3 diameter and type of filler metal
    - 1.1.4 type and condition of equipment
    - 1.1.5 welding technique
  - 1.2 select the appropriate shielding gas mixture based on the:
    - 1.2.1 mode of metal transfer
    - 1.2.2 base metal type and thickness
    - 1.2.3 joint design
    - 1.2.4 filler material
    - 1.2.5 desired weld quality
  - 1.3 describe how to select the type and size of filler metal
  - 1.4 explain how to avoid contamination of filler materials
  - 1.5 identify the relationship between:
    - 1.5.1 wire speed and amperage
    - 1.5.2 welding voltage and arc length
  - 1.6 describe the effects of:
    - 1.6.1 backhand or pull welding
    - 1.6.2 forehand or push welding
  - 1.7 describe the effects of torch angle on:
    - 1.7.1 weld penetration
    - 1.7.2 weld appearance
  - 1.8 describe corrective actions that can be taken to avoid:
    - 1.8.1 surface porosity
    - 1.8.2 subsurface porosity
    - 1.8.3 lack of fusion
    - 1.8.4 burn-through
    - 1.8.5 lack of penetration
    - 1.8.6 cold lapping

- 2. perform safe set-up, maintenance and troubleshooting procedures with FCAW equipment**
  - 2.1 perform maintenance required for wire drive systems and gun assemblies
  - 2.2 diagnose and demonstrate corrective measures for malfunctioning FCAW equipment
  - 2.3 for a given type of weld and/or weldment, select the appropriate:
    - 2.3.1 wire type, size and feed rate
    - 2.3.2 current
    - 2.3.3 shielding gas type and flow rate
  - 2.4 select the proper fit-up for a given weld
- 3. demonstrate safe FCAW practices and perform groove welds on mild steel plate in the horizontal and vertical positions**
  - 3.1 describe safety issues related to:
    - 3.1.1 using personal protective equipment
    - 3.1.2 handling and storing consumables
    - 3.1.3 keeping the welding area free of hazards
    - 3.1.4 ensuring adequate ventilation
  - 3.2 describe a safety plan in case of an accident
  - 3.3 apply safe work practices and procedures to:
    - 3.3.1 select and use appropriate personal protective equipment
    - 3.3.2 maintain a clean and tidy workstation
    - 3.3.3 demonstrate safe tool/material handling and storage techniques
  - 3.4 prepare and clean all surfaces to be welded
  - 3.5 properly position metal for welding
  - 3.6 demonstrate safe FCAW techniques and perform groove welds in the horizontal and vertical positions on mild steel plate
  - 3.7 identify problems common to out-of-position welding
  - 3.8 complete a visual inspection, i.e., non-destructive test, by observing and assessing:
    - 3.8.1 overall size, shape and appearance of beads
    - 3.8.2 plate penetration
    - 3.8.3 fusion
    - 3.8.4 degree of undercutting and overlapping
  - 3.9 perform a destructive test, where appropriate
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE FAB3050: ARC WELDING 3**

**Level:** Advanced

**Prerequisite:** FAB2060: Arc Welding 2

**Description:** Students learn the role of codes and standards in the welding trade, as well as test welds and develop vertical position welding skills.

**Parameters:** Access to a welding facility, complete with Shielded Metal Arc Welding (SMAW) equipment and supplies, and to instruction from an individual with welding trade qualifications.

**Outcomes:** The student will:

- 1. examine and maintain SMAW equipment and accessories**
  - 1.1 before beginning to weld:
    - 1.1.1 analyze the condition of cables and lugs
    - 1.1.2 ensure adequate air flow for proper cooling
    - 1.1.3 check the condition of all personal protective equipment
- 2. read and interpret weld drawings and symbols**
  - 2.1 explain the purpose of welding:
    - 2.1.1 codes
    - 2.1.2 standards
    - 2.1.3 specifications
  - 2.2 identify agencies that establish codes and standards in Canada and the United States; e.g., Canadian Standards Association, American Welding Society, Canadian Welding Bureau, American Society of Mechanical Engineers
  - 2.3 explain the purpose of a welding symbol
  - 2.4 identify the basic data included in a welding symbol
  - 2.5 show how a welding symbol can be used to specify the:
    - 2.5.1 location of a weld
    - 2.5.2 type of weld
    - 2.5.3 welding process
    - 2.5.4 root opening
    - 2.5.5 contour
    - 2.5.6 degree of penetration
    - 2.5.7 type of electrode
  - 2.6 analyze common destructive and non-destructive testing methods
  - 2.7 use a welding symbol to determine the:
    - 2.7.1 location of a weld
    - 2.7.2 type of weld
    - 2.7.3 root opening
    - 2.7.4 type of electrode
- 3. demonstrate advanced level SMAW competencies in the vertical position**
  - 3.1 use the appropriate equipment and supplies to make single and multiple pass fillet and groove welds in the vertical position
  - 3.2 perform one or more destructive and non-destructive tests on a weld sample

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

## **COURSE FAB3060: ARC WELDING 4**

**Level:** Advanced

**Prerequisite:** FAB3050: Arc Welding 3

**Description:** Students apply and extend positional welding skills by using a variety of common electrodes and thickness of materials.

**Parameters:** Access to a welding facility, complete with Shielded Metal Arc Welding (SMAW) equipment and supplies, and to instruction from an individual with welding trade qualifications.

**Outcomes:** The student will:

- 1. explain the effects heating and cooling have on a weld and weldment**
  - 1.1 describe the effect of single and multiple pass welds on the base metal and previously deposited filler metal
  - 1.2 explain the effect cold working conditions might have on weld quality
  - 1.3 explain the need to preheat or postheat
  - 1.4 describe the factors to be considered when choosing an electrode including:
    - 1.4.1 static and dynamic loading
    - 1.4.2 weld position
    - 1.4.3 materials to be welded
    - 1.4.4 current supply
    - 1.4.5 ease of use
    - 1.4.6 joint design and alignment
    - 1.4.7 rate of deposit
    - 1.4.8 depth of penetration
    - 1.4.9 weld finish
- 2. demonstrate advanced level SMAW competencies in the flat, horizontal and vertical positions**
  - 2.1 describe the properties and uses of the following electrodes:
    - 2.1.1 E6010 and E6011
    - 2.1.2 E7014, E7018 and E7024
  - 2.2 select the appropriate electrode for a given application
  - 2.3 prepare the surfaces for welding
  - 2.4 correctly position the weld
  - 2.5 adjust the equipment to coincide with the type of electrode, weld and metal thickness
  - 2.6 demonstrate first period arc welding skills in the flat, horizontal and vertical positions using a variety of weld types, joints, electrodes and thicknesses of mild steel
  - 2.7 prepare welds for testing
  - 2.8 perform a non-destructive and a destructive test, where appropriate
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems

- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE FAB3070: PIPE & TUBULAR WELDING**

**Level:** Advanced

**Prerequisite:** FAB3170: Gas Metal Arc Welding 2

**Description:** Students develop specific skills related to pipe layout, preparation of pipe/tube joints and welding techniques.

**Parameters:** Access to a welding facility, complete with welding equipment and supplies, and to instruction from an individual with welding trade qualifications.

**Supporting Courses:** FAB2040: Thermal Cutting  
FAB2060: Arc Welding 2  
FAB3050: Arc Welding 3

**Outcomes:** The student will:

- 1. take preventive measures to avoid accident and personal injury to self and others by identifying health and safety hazards associated with pipe and enclosed vessel welding**
  - 1.1 identify the standards of certification required for welding:
    - 1.1.1 low pressure water lines or light structural application
    - 1.1.2 medium pressure residential gas lines
    - 1.1.3 high pressure gas lines and motorcycle and aircraft frames
  - 1.2 identify the precautions that must be taken prior to cutting or welding pipe or other enclosed vessels
  - 1.3 review a safety plan in case of an accident
- 2. describe the advances made in pipe welding and identify common types of joints and welding procedures**
  - 2.1 list the advantages of welding over other forms of joining pipe related to:
    - 2.1.1 strength
    - 2.1.2 required maintenance
    - 2.1.3 flow of liquids and gases
    - 2.1.4 weight of joint
- 3. demonstrate basic pipe/tube preparation and welding competencies**
  - 3.1 calculate the cut angle for a butt joint in relation to the wall thickness and intended application
  - 3.2 prepare a template for one or more of the following joints:
    - 3.2.1 90° two-piece turn
    - 3.2.2 full T-joint
    - 3.2.3 full lateral joint
    - 3.2.4 butt joint
  - 3.3 perform a V-groove weld using roll and position pipe welding techniques
  - 3.4 prepare and perform a:
    - 3.4.1 full T-joint
    - 3.4.2 full lateral joint tube and pipe weld
  - 3.5 apply suitable destructive and non-destructive tests to ensure weld quality



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE FAB3080: AUTOMATED WELDING**

**Level:** Advanced

**Prerequisite:** FAB3170: Gas Metal Arc Welding 2

**Description:** Students investigate and describe the operation of various manual, semi-automated and automated welding processes and systems used in fabrication industries.

**Parameters:** Access to a welding facility, complete with welding equipment and supplies, and to instruction from an individual with welding trade qualifications.

**Supporting Courses:** FAB2030: Oxyfuel Welding  
FAB2040: Thermal Cutting  
FAB2060: Arc Welding 2

**Outcomes:** The student will:

- 1. explain how manual, semi-automated and automated welding processes differ from one another**
  - 1.1 explain the difference between manual, semi-automated and automated cutting and welding processes:
  - 1.2 research the use of robots in welding to determine their advantages and disadvantages
  - 1.3 identify the main types of robots and describe their work envelope
  - 1.4 identify the main parts of a robot and the components of a robotic welding system
- 2. apply knowledge of advanced welding processes to demonstrate/simulate an automated welding system**
  - 2.1 identify the hazards associated with specific machine and automated processes
  - 2.2 describe methods that are commonly used to protect an individual from injury by an automated system such as a robot
  - 2.3 describe a safety plan in case of an accident
  - 2.4 describe the specialized welding techniques that are suitable for semi-automated processes; e.g., resistance welding, Gas Metal Arc Welding (GMAW), Gas Tungsten Arc Welding (GTAW), plasma arc cutting, laser beam welding and cutting
  - 2.5 describe the use of a teach pendant in programming a robot to perform the designated task
  - 2.6 demonstrate or simulate a viable production system using semi- and/or fully automated processes
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems

- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE FAB3090: SHEET FABRICATION 4 (RADIAL LINE)**

**Level:** Advanced

**Prerequisite:** FAB2100: Sheet Fabrication 3 (Parallel Line)

**Description:** Students develop specialized skills in cylindrical and conical pattern development and seam construction of ferrous and non-ferrous sheet metals.

**Parameters:** Access to a fabrication facility, complete with sheet metal shearing, forming, fastening and layout tools, and to instruction from an individual with specialized training in sheet metal practices.

**Outcomes:** The student will:

- 1. describe the procedures that are used to lay out a typical cylindrical and conical shape**
  - 1.1 research the properties of and applications of the following sheet materials:
    - 1.1.1 aluminum
    - 1.1.2 copper
    - 1.1.3 brass
    - 1.1.4 galvanized steel
    - 1.1.5 mild steel
    - 1.1.6 stainless steel
    - 1.1.7 tin plate
  - 1.2 describe which materials are most malleable
  - 1.3 describe the techniques that are used to form sheet stock
  - 1.4 explain when single, double, grooved and wired seams are used in conjunction with cylindrical and conical fabrication
  - 1.5 identify and describe the use of the following solder coppers:
    - 1.5.1 square point
    - 1.5.2 bottoming
    - 1.5.3 roofing
- 2. demonstrate parallel and radial line pattern making skills**
  - 2.1 describe the type of pattern development that is used to lay out a:
    - 2.1.1 cylinder
    - 2.1.2 cone
    - 2.1.3 rectangle to round
  - 2.2 create the necessary pattern development, using a computer or conventional means
- 3. perform advanced cylindrical and conical sheet stock fabrication skills and processes**
  - 3.1 use a micrometer, calliper or sheet gauge to measure the thickness of a piece of sheet stock
  - 3.2 calculate the inside, outside and mean diameter of a cylindrical component
  - 3.3 identify the correct formula to calculate the allowances for seams and edges
  - 3.4 select a product that incorporates:
    - 3.4.1 cylindrical and conical shapes
    - 3.4.2 grooved and double seams
    - 3.4.3 solder joints and finished edges
  - 3.5 select the appropriate material for a given product and finish

- 3.6 use the appropriate tools, materials and processes to:
  - 3.6.1 cut and bend sheet stock
  - 3.6.2 raise and finish a surface
  - 3.6.3 locate and make joints watertight
- 3.7 wear personal protective clothing and equipment
- 3.8 show that tools are kept in working order
- 3.9 handle, store and discard metal off-cuts in a correct manner

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals



## **COURSE FAB3110: SHEET FABRICATION 5 (DUCT COMPONENTS)**

**Level:** Advanced

**Prerequisite:** FAB2100: Sheet Fabrication 3 (Parallel Line)

**Description:** Students apply and develop specialized skills in duct component pattern making and fabrication techniques.

**Parameters:** Access to a fabrication facility, complete with sheet metal shearing, forming, fastening and layout tools, and to instruction from an individual with specialized training in sheet metal practices.

**Supporting Course:** FAB3090: Sheet Fabrication 4 (Radial Line)

**Outcomes:** The student will:

**1. identify common duct components and applications**

- 1.1 prepare a list of duct system applications
- 1.2 list and state the purpose of the following components used in a duct system:
  - 1.2.1 radius elbow
  - 1.2.2 riser
  - 1.2.3 offset
  - 1.2.4 branch tee
  - 1.2.5 take-off
- 1.3 describe how air volume and pressures are measured
- 1.4 analyze the effect of component resistance on static and velocity air pressures in a ducting system

**2. demonstrate the principle of triangulation to create a transition pattern**

- 2.1 differentiate among the use of parallel line, radial line and triangulation in pattern development
- 2.2 use triangulation to develop a pattern for an object whose sides are not parallel

**3. apply pattern making and sheet metal fabrication skills to create a duct component**

- 3.1 list and describe the use and construction of the following joints:
  - 3.1.1 S and drive
  - 3.1.2 T-lock
  - 3.1.3 hammerlock
  - 3.1.4 government locks
- 3.2 state the advantages and disadvantages of using each of the above systems
- 3.3 calculate the material allowance for:
  - 3.3.1 S and drive
  - 3.3.2 T-lock
  - 3.3.3 hammerlock
- 3.4 use the appropriate tools, materials and processes to fabricate specific components in a ducting system

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE FAB3120: FOUNDRY 3 (CORE MOULDING)**

**Level:** Advanced

**Prerequisite:** FAB1120: Foundry 1 (One-piece Pattern)

**Description:** Students investigate and apply advanced foundry processes to produce a hollow casting, using a sand and core mould.

**Parameters:** Access to a fabrication facility, complete with foundry equipment and supplies, and to instruction from an individual with specialized training in foundry practices.

**Supporting Course:** FAB2120: Foundry 2 (Split Pattern)

**Outcomes:** The student will:

### **1. list and describe common core materials and production processes**

- 1.1 explain the purpose of a core and provide examples of products that require their use in casting
- 1.2 describe the variables and characteristics of a good core mix
- 1.3 identify common shapes and methods of producing and drying a core
- 1.4 for a given casting, identify the appropriate core shape placement technique, core mix and reinforcement techniques
- 1.5 prepare a sketch showing the location of:
  - 1.5.1 parting line and type of mould
  - 1.5.2 core and core prints
  - 1.5.3 venting, gating and pouring system for a given casting

### **2. demonstrate advanced sand casting and coring skills and techniques**

- 2.1 identify common binders that can be used with core sand; e.g.: sodium silicate and carbon dioxide, linseed oil, wheat flour and molasses, and other commercially prepared products
- 2.2 describe safety concerns related to:
  - 2.2.1 personal protective equipment
  - 2.2.2 mould construction
  - 2.2.3 foundry furnace start-up and shut-down procedures
  - 2.2.4 heating and pouring procedures
  - 2.2.5 cleaning and finishing castings
- 2.3 describe a safety plan in case of an accident
- 2.4 create a casting using common pattern making, coring and pouring techniques
- 2.5 clean and finish the casting according to specifications
- 2.6 analyze the overall size, shape and structural soundness of the product

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems

- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely

- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. create a transitional strategy to accommodate personal changes and build personal values**

- 4.1 identify short-term and long-term goals
- 4.2 identify steps to achieve goals

## **COURSE FAB3130: PRECISION TURNING 2**

**Level:** Advanced

**Prerequisite:** FAB2130: Precision Turning 1

**Description:** Students develop specialized lathe skills for thread cutting and taper turning techniques.

**Parameters:** Access to a fabrication facility, complete with a metal lathe and accessories, and to instruction from an individual with specialized training in metal lathe practices.

**Outcomes:** The student will:

### **1. demonstrate print reading and job sequencing competencies**

- 1.1 use a machine drawing to identify the:
  - 1.1.1 overall size and shape of a machine part
  - 1.1.2 thread type, size, tolerance and fit
  - 1.1.3 taper type, size and fit
  - 1.1.4 materials
- 1.2 research hole-machining operation procedures
- 1.3 create a systematic sequence of operations to machine a given part
- 1.4 calculate the appropriate cutting speeds, feed rates and depth of cuts for a given operation

### **2. perform safe taper turning and thread cutting set-up procedures**

- 2.1 describe the hazards associated with metal lathes and metal cutting operations
- 2.2 list and describe common lathe accessories such as drill chuck, taper attachment and thread dial
- 2.3 list and describe common types of tapers including:
  - 2.3.1 Morse taper
  - 2.3.2 standard milling machine taper
  - 2.3.3 taper pins
- 2.4 identify the parts of a thread
- 2.5 describe a safety plan in case of an accident

### **3. perform taper turning and thread cutting operations**

- 3.1 observe methods of cutting a taper by using the:
  - 3.1.1 compound rest
  - 3.1.2 tailstock offset
  - 3.1.3 taper attachment methods
- 3.2 identify the factors that determine the most efficient method of cutting a taper including the:
  - 3.2.1 length and angle of taper
  - 3.2.2 quality of finish
  - 3.2.3 number of duplicates
- 3.3 describe the principal features of a:
  - 3.3.1 Unified National Coarse
  - 3.3.2 Unified National Fine
  - 3.3.3 tapered pipe thread
  - 3.3.4 ISO metric thread
- 3.4 describe the set-up procedures to cut internal and external left- and right-handed threads
- 3.5 describe the classes of fit associated with the Unified thread system



- 3.6 demonstrate skills in:
  - 3.6.1 hole-machining operations
  - 3.6.2 inside and outside taper turning
  - 3.6.3 cutting inside and outside threads
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE FAB3140: PRECISION MILLING 2**

**Level:** Advanced

**Prerequisite:** FAB2140: Precision Milling 1

**Description:** Students develop specialized skills to use vertical and/or horizontal milling machines.

**Parameters:** Access to a fabrication facility, complete with a horizontal mill and accessories, and to instruction from an individual with specialized training in advanced level machining practices.

**Outcomes:** The student will:

### **1. demonstrate print reading and job sequencing competencies**

- 1.1 use a machine drawing to determine:
  - 1.1.1 the overall size and shape of a machine part
  - 1.1.2 specific types and sizes of grooves/slots, keyways and gear teeth
- 1.2 list and describe the machining operations for a given machine part and/or feature in a logical sequence
- 1.3 identify the appropriate type of milling machine and cutters for each operation
- 1.4 select workpiece holding device
- 1.5 calculate the appropriate cutting speeds, feed rates and recommended depths of cut for a given operation
- 1.6 select appropriate cutting fluids

### **2. perform safe vertical and/or horizontal mill set-up procedures**

- 2.1 describe the hazards associated with manual milling operations
- 2.2 describe a safety plan in case of an accident
- 2.3 describe safe set-up procedures to mill grooves, keyways and gear teeth
- 2.4 identify the conditions that produce cutter failure including:
  - 2.4.1 excessive heat
  - 2.4.2 clogging
  - 2.4.3 work hardening
- 2.5 identify common machine parts that require indexing

### **3. perform groove keyway and gear cutting operations**

- 3.1 identify and describe the types of cutters that are available for cutting common grooves/slots, keyways and gear teeth
- 3.2 explain the difference between a high speed steel and a tungsten carbide cutter
- 3.3 describe how an indexing head is used when cutting a spur gear
- 3.4 demonstrate skills in milling:
  - 3.4.1 grooves/slots
  - 3.4.2 keyways
  - 3.4.3 gear teeth

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE FAB3150: CNC MILLING (COMPUTER NUMERICAL CONTROL)**

**Level:** Advanced

**Prerequisite:** FAB1130: Principles of Machining

**Description:** Students develop skills in computer numerical control (CNC) programming to manufacture a three-dimensional product.

**Parameters:** Access to a CNC milling centre and to instruction from an individual with specialized training in CNC millwork.

**Supporting Course:** FAB2150: CNC Turning (Computer Numerical Control)

**Outcomes:** The student will:

### **1. demonstrate three-dimensional CNC programming skills**

- 1.1 identify the relationship of the x, y and z axis on a vertical milling machine
- 1.2 determine how to program a CNC mill using absolute coordinates
- 1.3 describe the types of canned cycles used in machining operations
- 1.4 identify when to use canned cycles to improve efficiency
- 1.5 list the information required to calculate and format a canned cycle
- 1.6 prepare a program from a print using absolute coordinates and/or produce a computer assisted drafting (CAD) design

### **2. apply CNC programming and operating skills to manufacture a milled part**

- 2.1 after observing the operation of a CNC mill, describe how the cutting speeds, feed rates and depth of cuts are controlled, and how the cutting tools and different sizes and shapes of workpieces are mounted
- 2.2 identify the milling capabilities of a given machine; e.g., size of cutters, size and types of materials
- 2.3 describe the safety features that are built into the CNC equipment
- 2.4 describe the:
  - 2.4.1 appropriate use of personal protective equipment
  - 2.4.2 importance of keeping all covers and guards in place and following the manufacturer's recommendations
  - 2.4.3 need to keep the work area clean and free of personal hazards
- 2.5 describe a safety plan in case of an accident
- 2.6 load the program or convert a CAD file
- 2.7 mount and secure the workpiece
- 2.8 identify reference and clearance points
- 2.9 mount and set cutting tool(s)
- 2.10 carry out a test run
- 2.11 manufacture the part
- 2.12 inspect the part to see that it meets the print dimensions, tolerances and specifications

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

### **4. create a transitional strategy to accommodate personal changes and build personal values**

- 4.1 identify short-term and long-term goals
- 4.2 identify steps to achieve goals



## **COURSE FAB3160: PREFABRICATION PRINCIPLES**

**Level:** Advanced

**Prerequisite:** FAB2160: Custom Fabrication

**Description:** Students work in a cooperative learning environment to plan and construct a prefabricated product/structure to meet the specific needs of a client.

**Parameters:** Access to fabrication facilities and equipment, and to instruction from an individual with journey person qualifications if students are involved in customer work related to welding or other trade-related activities.

**Outcomes:** The student will:

- 1. perform basic shop drawing take-off skills**
  - 1.1 explain procedures that are used to create a cutting list from a shop drawing
  - 1.2 create a cutting list from a shop drawing
- 2. demonstrate advanced level resource management skills**
  - 2.1 locate appropriate materials and supplies
  - 2.2 identify specialized equipment and processes that will be required
  - 2.3 prepare a production flowchart
  - 2.4 show how to meet with the customer to determine the product/structure specifications
  - 2.5 create a suitable prefabricated design, time line and budget
  - 2.6 show how to apprise the customer of any need to make changes
- 3. demonstrate appropriate prefabrication skills and practices**
  - 3.1 cite examples of products that are built from prefabricated parts
  - 3.2 describe the advantages and disadvantages of prefabricating a component
  - 3.3 identify specific design considerations that must be adhered to when using prefabricated components
  - 3.4 describe safe rigging procedures that are used to move materials and components
  - 3.5 prepare the required templates, jigs and fixtures
  - 3.6 assign responsibilities to:
    - 3.6.1 break out materials according to a prearranged plan
    - 3.6.2 process materials with a minimum number of set-ups
    - 3.6.3 assemble, finish and prepare the product for delivery
  - 3.7 explain the need to:
    - 3.7.1 identify group and individual responsibilities
    - 3.7.2 identify and capitalize on individual strengths
  - 3.8 help install/assemble the product, if contracted
  - 3.9 participate in group and self-evaluation processes
  - 3.10 demonstrate strategies for positive criticism
  - 3.11 complete a customer satisfaction follow-up survey
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE FAB3170: GAS METAL ARC WELDING 2**

**Level:** Advanced

**Prerequisite:** FAB2070: Gas Metal Arc Welding 1

**Description:** Students develop skills to evaluate and improve the quality of gas metal arc weldings, and they extend their Gas Metal Arc Welding (GMAW) skills by performing horizontal and vertical groove welds.

**Parameters:** Access to a fabrication work centre, complete with GMAW equipment and supplies, and to instruction from an individual with welding trade qualifications.

**Outcomes:** The student will:

- 1. identify variables that affect the quality of gas metal arc welds and identify strategies to evaluate and improve weld quality**
  - 1.1 identify the variables that can directly affect weld quality; e.g., the welding current and voltage, type of shielding gas/flux, diameter and type of filler metal, type and condition of equipment, welding technique
  - 1.2 select the appropriate shielding gas mixture based on:
    - 1.2.1 mode of metal transfer
    - 1.2.2 base metal type and thickness
    - 1.2.3 joint design
    - 1.2.4 filler material
    - 1.2.5 desired weld quality
  - 1.3 describe how to select the type and size of filler metal
  - 1.4 explain how to avoid contamination of filler materials
  - 1.5 identify the relationship between:
    - 1.5.1 wire speed and amperage
    - 1.5.2 welding voltage and arc length
  - 1.6 describe the effects of:
    - 1.6.1 backhand or pull welding
    - 1.6.2 forehand or push welding
  - 1.7 describe the effects of torch angle on:
    - 1.7.1 weld penetration
    - 1.7.2 weld appearance
  - 1.8 complete a visual inspection, i.e., non-destructive test, by observing and assessing:
    - 1.8.1 overall size, shape and appearance of beads
    - 1.8.2 plate penetration
    - 1.8.3 fusion
    - 1.8.4 degree of undercutting and overlapping
  - 1.9 perform a destructive test, where appropriate
- 2. perform safe set-up, maintenance and troubleshooting procedures with GMAW equipment**
  - 2.1 apply safe work practices and procedures to:
    - 2.1.1 select and use appropriate personal protective equipment
    - 2.1.2 maintain a clean and tidy work station
    - 2.1.3 demonstrate safe tool/material handling and storage techniques

- 2.2 for a given type of weld and/or weldment, select the appropriate:
  - 2.2.1 wire type, size and feed rate
  - 2.2.2 current
  - 2.2.3 shielding gas type and flow rate
- 2.3 select the proper fit-up for a given weld
- 2.4 describe corrective actions that can be taken to avoid:
  - 2.4.1 surface porosity
  - 2.4.2 subsurface porosity
  - 2.4.3 lack of fusion
  - 2.4.4 burn-through
  - 2.4.5 lack of penetration
  - 2.4.6 cold lapping
- 2.5 identify problems common to out-of-position welding
- 2.6 perform maintenance required for wire drive systems and gun assemblies
- 2.7 diagnose and demonstrate corrective measures for malfunctioning GMAW equipment
- 3. demonstrate safe GMAW practices to perform groove welds on mild steel plate in the horizontal and vertical positions**
  - 3.1 describe safety issues related to:
    - 3.1.1 using personal protective equipment
    - 3.1.2 handling and storing consumables
    - 3.1.3 keeping the welding area free of hazards
    - 3.1.4 ensuring adequate ventilation
  - 3.2 describe a safety plan in case of an accident
  - 3.3 prepare and clean all surfaces to be welded
  - 3.4 properly position metal for welding
  - 3.5 demonstrate safe GMAW techniques and perform groove welds in the horizontal and vertical positions on mild steel plate
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



**COURSE FAB3910: FAB PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved



#### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

#### **5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

**COURSE FAB3920: FAB PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE WDA3400: FABRICATION ORIENTATION & SAFETY**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop an understanding of basic work site safety practices.

**Parameters:** Access to a materials work centre, complete with basic fabrication tools, and to instruction from an individual with specialized training in the welding trade.

**ILM Resources:** Welder Apprenticeship Training Program Orientation 120101a, Safety Guidelines 120101b, Welding Safety 120101c

**Outcomes:** The student will:

### **1. describe the responsibilities and opportunities in the welding trade**

- 1.1 identify and describe the apprenticeship training system in Alberta including:
  - 1.1.1 its history
  - 1.1.2 designated trades and occupations in Alberta
  - 1.1.3 patterns of apprenticeship training
  - 1.1.4 local and provincial apprenticeship committees
  - 1.1.5 the Red Seal Program
  - 1.1.6 technical training registration procedures
  - 1.1.7 safety education
- 1.2 identify and describe the training profile of the welding apprenticeship training program in Alberta including:
  - 1.2.1 the development of a welder training profile
- 1.3 explain the welder program outcomes and objectives including:
  - 1.3.1 learning outcomes and objectives
  - 1.3.2 apprenticeship exam questions
- 1.4 describe the responsibilities for the contract of apprenticeship training program by the apprentice, employer and Alberta Apprenticeship and Industry Training:
- 1.5 identify industrial, commercial and construction fields that provide employment opportunities for welders; e.g., dual trade and multi-trade qualifications
- 1.6 discuss the content of the Welding Training Record Book
- 1.7 demonstrate the ability to complete a résumé and a cover letter:

### **2. identify, describe or explain the *Workers' Compensation Act*, *Occupational Health and Safety Act*, and the Workplace Hazardous Materials Information System (WHMIS) guidelines**

- 2.1 identify and describe applications of the *Workers' Compensation Act* in the workplace
- 2.2 identify, locate and interpret sections of the *Occupational Health and Safety Act* and general safety regulations as they apply to welding
- 2.3 identify and explain the WHMIS program related to:
  - 2.3.1 worker education
  - 2.3.2 labels
  - 2.3.3 other means of identification
  - 2.3.4 material safety data sheets

- 2.4 identify and describe the procedure for welding or cutting in confined spaces or dangerous enclosures including:
  - 2.4.1 welding or cutting in the presence of flammables
  - 2.4.2 working in a confined space
  - 2.4.3 rendering containers safe for welding and cutting
- 3. apply safe work practices and procedures when using welding or cutting equipment**
  - 3.1 identify physical hazards that are common to welding and cutting operations that impact welding safety including:
    - 3.1.1 radiant energy hazards
    - 3.1.2 hazards associated with temperature extremes
    - 3.1.3 noise hazards
  - 3.2 identify the use of the following personal protective equipment for welding and cutting operations:
    - 3.2.1 head protection
    - 3.2.2 eye protection
    - 3.2.3 protective clothing
    - 3.2.4 welding gloves
    - 3.2.5 footwear
    - 3.2.6 hearing protection
  - 3.3 identify fire hazards and methods of fire prevention including:
    - 3.3.1 classes of fires
  - 3.4 identify and explain hazards with welding fumes and gases including:
    - 3.4.1 occupational exposure limits
    - 3.4.2 hydrogen sulphide gas and sulphur dioxide gas
  - 3.5 identify welding fume ventilation methods
  - 3.6 identify personal protective equipment for hazardous and toxic materials that:
    - 3.6.1 protects a person from fumes
    - 3.6.2 is a face piece
    - 3.6.3 is a type of respirator
  - 3.7 identify the effects of electricity and safety precautions used to prevent injury from electric shock; e.g., avoiding electric shock, rescue procedures for electric shock victims
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE WDA3405: FABRICATION TOOLS & WELD FAULTS**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop knowledge and skills in the use of basic hand and power tools used in fabrication processes. Identify the causes of faults in welds and methods for their prevention.

**Parameters:** Access to a materials work centre, complete with basic hand and power tools, and to instruction from an individual with specialized training.

**ILM Resources:** Hand Tools 120101d, Power Tools 120101e, Weld Faults 120101f

**Supporting Resources:** Apprentice Record Book: Blue Book, Fractions 120104a, Decimals 120104b, Percentage and Ratios 120104c, Geometric Formulas 120104d, Metric and Imperial Measurement 120104e

**Outcomes:** The student will:

### **1. identify and describe the safe use of hand tools**

- 1.1 describe safety precautions and general safety procedures for hand tools
- 1.2 identify and describe layout and measuring tools and their uses including:
  - 1.2.1 three general categories for measuring and layout tools
  - 1.2.2 marking tools
- 1.3 identify and describe clamping tools and their uses including:
  - 1.3.1 pliers
  - 1.3.2 clamps
- 1.4 identify and describe cutting tools and their uses including:
  - 1.4.1 hacksaws
  - 1.4.2 files
  - 1.4.3 chisels
  - 1.4.4 metal snips
  - 1.4.5 diagonal pliers and bolt cutters
  - 1.4.6 hand shears
- 1.5 identify and describe other hand tools and their uses including:
  - 1.5.1 hammers
  - 1.5.2 screwdrivers
  - 1.5.3 punches
  - 1.5.4 pinch bars and pry bars
  - 1.5.5 wrenches
  - 1.5.6 wire brushes

### **2. identify and describe the safe use of power tools**

- 2.1 demonstrate and describe the safe operation of bench, pedestal, angle and straight grinders including:
  - 2.1.1 general grinding safety
  - 2.1.2 pedestal and bench grinders
  - 2.1.3 grinding wheels
  - 2.1.4 portable grinders

- 2.2 demonstrate and describe the use and safe operation of portable power drills, drill presses and twist drills including:
  - 2.2.1 drilling machines
  - 2.2.2 drill chucks
  - 2.2.3 twist drills
  - 2.2.4 lubricants, coolants and cutting fluids
- 2.3 describe the use and safe operation of metal forming and shaping tools including:
  - 2.3.1 plate rolls
  - 2.3.2 power brakes
  - 2.3.3 power benders
  - 2.3.4 presses
  - 2.3.5 trip hammers
- 2.4 identify and describe the procedures for cutting metals using:
  - 2.4.1 cutting machines
  - 2.4.2 plate shears
  - 2.4.3 ironworker machines
  - 2.4.4 cut-off saws
  - 2.4.5 shearing machines
  - 2.4.6 metal cutting band saws
- 3. identify and describe weld faults, their causes and how they can be prevented**
  - 3.1 define the major classification of weld faults including:
    - 3.1.1 weld fault classification
    - 3.1.2 definition of weld faults
    - 3.1.3 three general classes of weld faults
  - 3.2 define the notching effect and the following:
    - 3.2.1 stress flow lines and the notching effect
    - 3.2.2 failure to taper out rapid changes in cross-section
    - 3.2.3 tapered transition
    - 3.2.4 failure to taper out rapid changes in contour
    - 3.2.5 stress flow on lap joints
    - 3.2.6 failure to fill craters or to fill and float over weld ends
  - 3.3 identify basic weld faults, causes and ways to avoid them including:
    - 3.3.1 dimensional defects
    - 3.3.2 dimensional faults after welding
    - 3.3.3 structural discontinuities
    - 3.3.4 surface defects
    - 3.3.5 internal defects
    - 3.3.6 cracking
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely

- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. **create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE WDA3410: OXYFUEL WELDING**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop basic skills in the safe handling and operation of oxyacetylene equipment.

**Parameters:** Access to a materials work centre, complete with oxyfuel welding equipment and fabrication facilities, and to instruction from an individual with journeyperson certification in the welding trade.

**ILM Resources:** Oxyfuel Equipment 120101g, Oxyfuel Welding, Brazing and Braze Welding 120101h, Oxyfuel Cutting 120101i

**Supporting Resources:** Apprentice Record Book: Blue Book, Fractions 120104a, Decimals 120104b, Percentage and Ratios 120104c, Geometric Formulas 120104d, Metric and Imperial Measurement 120104e

**Outcomes:** The student will:

### **1. assemble oxyfuel equipment**

- 1.1 describe characteristics and handling procedures for oxygen, acetylene and alternative fuel gases
- 1.2 describe functions of oxyfuel equipment components including:
  - 1.2.1 oxygen storage and use
  - 1.2.2 acetylene cylinders
  - 1.2.3 rules for handling compressed gas cylinders
  - 1.2.4 identification of gases in cylinders
  - 1.2.5 the oxyacetylene outfit
- 1.3 demonstrate the use, care and maintenance of oxyfuel equipment components including:
  - 1.3.1 regulator malfunctions
  - 1.3.2 hose maintenance
  - 1.3.3 torch and torch mixer maintenance
  - 1.3.4 care and maintenance of tips
- 1.4 explain recommended procedures for placement, set-up and shutdown of oxyfuel equipment including:
  - 1.4.1 setting up the oxyacetylene outfit
  - 1.4.2 detecting leaks using leak detection fluids
  - 1.4.3 shutting down equipment
- 1.5 identify causes and prevention measures for backfires, flashbacks and burnbacks
- 1.6 describe pressure and flame adjustments:
  - 1.6.1 lighting the torch
  - 1.6.2 gas speed and the speed of flame propagation
  - 1.6.3 types of flames
  - 1.6.4 stages of combustion



## **2. perform oxyfuel welding, braze welding and brazing**

- 2.1 describe filler rods and fluxes including:
  - 2.1.1 definition of terms related to filler rods and fluxes
  - 2.1.2 selecting an oxyfuel filler rod to suit the job
  - 2.1.3 filler metal types and specifications
  - 2.1.4 AWS A5.2–92 specifications for carbon and low alloy steel rods for oxyfuel gas welding
  - 2.1.5 AWS A5.8–92 specifications for filler metal for brazing and braze welding
  - 2.1.6 fluxes
  - 2.1.7 data sheets
- 2.2 demonstrate the ability to run lines of fusion with and without filler rods in the flat and vertical positions through:
  - 2.2.1 preparation of materials for welding
  - 2.2.2 run lines of fusion; e.g., flat, vertical
  - 2.2.3 beading
- 2.3 demonstrate the ability to weld lap joints on 10 or 11 ga. (3.00–3.25 mm) mild steel in the horizontal (2F) and vertical (3F) positions, using a comparable filler material including:
  - 2.3.1 fusion welding of horizontal lap joints
  - 2.3.2 fusion welding of vertical lap joints
- 2.4 demonstrate the ability to weld butt joints on 10 or 11 ga. mild steel in the flat (1G) and vertical (3G) positions, using a comparable filler material including:
  - 2.4.1 fusion welding of vertical butt joints
  - 2.4.2 fusion welding of flat butt joints
- 2.5 demonstrate the ability to weld lap joints on 10 or 11 ga. mild steel in the vertical position, using a braze welding filler material including:
  - 2.5.1 braze welding of vertical lap joints

## **3. perform oxyfuel cutting**

- 3.1 demonstrate the ability to safely operate a hand-held oxyfuel cutting torch on mild steel plate and structural shapes by understanding:
  - 3.1.1 principles of rapid oxidation
  - 3.1.2 terms associated with cutting
  - 3.1.3 travel speed and drag
  - 3.1.4 gases used for oxyfuel cutting
  - 3.1.5 torch and tip designs
  - 3.1.6 types of cutting tips
  - 3.1.7 accessories for hand cutting
  - 3.1.8 points to consider for good cutting
  - 3.1.9 starting the cut
  - 3.1.10 piercing holes
  - 3.1.11 stack cutting
  - 3.1.12 metals that present problems to flame cutting
- 3.2 perform straight line, bevel and shape cutting on mild steel using cutting methods followed by an exercise; e.g., shop projects
- 3.3 pierce and cut holes in mild steel plate including:
  - 3.3.1 pierce a plate and cut an S-beam shape
  - 3.3.2 follow-up with an exercise
- 3.4 cope 3/8" mild steel to fit a 4" channel member including:
  - 3.4.1 cope, bevel and shape cutting
  - 3.4.2 follow-up with an exercise
- 3.5 demonstrate the ability to safely operate a machine oxyfuel cutting torch on mild steel plate and follow-up with an exercise

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals



## **COURSE WDA3415:      GAS METAL ARC WELDING**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop basic knowledge and skills related to the use of Gas Metal Arc Welding (GMAW).

**Parameters:** Access to a fabrication work centre, complete with GMAW equipment and supplies, and to instruction from an individual with formal journey person certification in the welding trade.

**ILM Resources:** Gas Metal Arc Welding (GMAW) – Equipment 120103a, GMAW Filler Metals, Shielding Gases and Safety 120103b, GMAW Equipment Maintenance and Troubleshooting 120103c

**Supporting Resources:** Apprentice Record Book: Blue Book, Fractions 120104a, Decimals 120104b, Percentage and Ratios 120104c, Geometric Formulas 120104d, Metric and Imperial Measurement 120104e

**Outcomes:** The student will:

### **1. identify and select GMAW equipment**

- 1.1 describe the principles of operation of GMAW including the history of GMAW
- 1.2 identify the components of a basic GMAW set-up including:
  - 1.2.1 equipment for GMAW
  - 1.2.2 power sources
  - 1.2.3 wire feeder
  - 1.2.4 electrode holders and cable assembly
  - 1.2.5 spooled filler wire
  - 1.2.6 shielding gas
  - 1.2.7 regulators/flowmeters
  - 1.2.8 cooling system
- 1.3 describe the following modes of metal transfer obtained with GMAW:
  - 1.3.1 pinch effect
  - 1.3.2 short-circuiting metal transfer
  - 1.3.3 globular transfer
  - 1.3.4 spray transfer
- 1.4 describe GMAW power sources and wire feeders including:
  - 1.4.1 wire feed control and drive units
  - 1.4.2 power source and wire feeder operating variables
  - 1.4.3 power sources for pulsed spray arc transfer mode
- 1.5 describe GMAW wire drive systems and welding gun and cable assemblies
- 1.6 identify shielding gas supply systems for GMAW including:
  - 1.6.1 cylinder identification, storage and handling
  - 1.6.2 regulators
  - 1.6.3 flowmeters
  - 1.6.4 equipment selection guidelines
  - 1.6.5 hoses
  - 1.6.6 solenoid valves

**2. identify GMAW filler metals including:**

- terms associated with GMAW filler metals
- manufacture of filler wires
- chemistry and wire sizing
- testing requirements
- identification and packaging
- cast and helix
- wire finish
- selection of filler wire
- choosing the correct wire size
- filler wire classifications
- American Welding Society specifications
- Canadian Standards Association standards
- classification of low carbon steel filler metals for GMAW
- electrode wire applications
- GMAW electrode wire characteristics and applications
- GMAW filler metals packaging
- handling consumables
- storing GMAW consumables

**2.1 identify shielding gases for GMAW including:**

- 2.1.1 basic properties of shielding gases
- 2.1.2 applications of shielding gases used with GMAW
- 2.1.3 advantages and disadvantages of various shielding gases
- 2.1.4 metal

**2.2 identify advantages and disadvantages of GMAW**

**2.3 identify the precautions against electrical shock, toxic fumes and radiant energy associated with GMAW including:**

- 2.3.1 safety
- 2.3.2 electric hazards
- 2.3.3 toxic fumes
- 2.3.4 personal protection

**3. identify set-up, maintenance and troubleshooting of GMAW equipment**

**3.1 describe and demonstrate the set-up and maintenance for wire drive systems and gun assemblies by:**

- 3.1.1 setting up equipment for GMAW
- 3.1.2 selecting and feeling the electrode wire
- 3.1.3 attaching a wire cleaner
- 3.1.4 adjusting the brake
- 3.1.5 following daily shutdown procedures
- 3.1.6 ensuring ongoing maintenance of equipment

**3.2 diagnose and demonstrate corrective measures for malfunctioning GMAW equipment by:**

- 3.2.1 using corrective measures with welding techniques
- 3.2.2 using corrective measures with wire feed equipment
- 3.2.3 troubleshooting wire feed equipment
- 3.2.4 identifying weld defects



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals



**COURSE WDA3420: FLUX CORED ARC WELDING & SUBMERGED ARC WELDING**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop basic knowledge and skills related to the use of Flux Cored Arc Welding (FCAW) and the theory of Submerged Arc Welding (SAW).

**Parameters:** Access to a fabrication work centre, complete with FCAW equipment and supplies, as well as to instruction from an individual with journey person certification in the welding trade.

**ILM Resources:** Flux Cored Arc Welding (FCAW) 120103d, Submerged Arc Welding (SAW) 120103e

**Supporting Resources:** Apprentice Record Book: Blue Book, Fractions 120104a, Decimals 120104b, Percentage and Ratios 120104c, Geometric Formulas 120104d, Metric and Imperial Measurement 120104e

**Outcomes:** The student will:

**1. select and use FCAW equipment and consumables**

- 1.1 describe the principles of operation of FCAW including:
  - 1.1.1 the history of FCAW
  - 1.1.2 applications
- 1.2 identify the components of a basic FCAW set-up including:
  - 1.2.1 power sources
  - 1.2.2 wire feeders
  - 1.2.3 electrode holders and cable assembly
  - 1.2.4 spooled filler wires
  - 1.2.5 shielding gas
  - 1.2.6 regulator/flowmeters
  - 1.2.7 cooling systems
- 1.3 describe FCAW power sources, wire feeders and gun and cable assemblies including:
  - 1.3.1 wire feeder control and drive units
  - 1.3.2 wire feeder drive roll assemblies
  - 1.3.3 welding gun and cable assemblies
- 1.4 describe FCAW operating variables
- 1.5 identify shielding gases for FCAW including:
  - 1.5.1 applications of shielding gases used with FCAW
  - 1.5.2 FCAW shielding gas flow rates
- 1.6 describe FCAW filler metals and the following:
  - 1.6.1 terms associated with FCAW filler metals
  - 1.6.2 manufacture of flux-cored wires
  - 1.6.3 operating characteristics of FCAW wires
  - 1.6.4 functions of the flux of FCAW wires
  - 1.6.5 selection of filler wire

- 1.6.6 choosing the correct wire size
- 1.6.7 FCAW filler metals packaging
- 1.6.8 filler wire classifications for FCAW
- 1.6.9 American Welding Society (AWS) specifications
- 1.6.10 Canadian Standards Association (CSA) standards
- 1.6.11 consumables storage and handling
- 1.6.12 electrode wire applications
- 1.6.13 FCAW electrode wire characteristics and applications
- 1.6.14 metal-cored electrode wire characteristics and applications
- 1.7 describe FCAW equipment maintenance and troubleshooting; e.g., ongoing maintenance of FCAW equipment
- 1.8 identify advantages and disadvantages of FCAW
- 2. select SAW equipment and consumables**
- 2.1 describe the principles of operation of SAW including:
  - 2.1.1 the history of SAW
  - 2.1.2 applications
- 2.2 identify the components of a basic SAW set-up including:
  - 2.2.1 SAW power sources
  - 2.2.2 welding head assembly
  - 2.2.3 travel carriage
  - 2.2.4 fixtures and positioners
  - 2.2.5 spooled filler wire
  - 2.2.6 flux
  - 2.2.7 flux feed and recovery equipment
  - 2.2.8 work lead connection
- 2.3 describe SAW power sources, wire feeders, flux feed systems, welding head assemblies and control systems
- 2.4 describe SAW operating variables and effects of polarity
- 2.5 identify SAW filler metals and fluxes and the following:
  - 2.5.1 terms associated with SAW filler metals and fluxes
  - 2.5.2 manufacture of filler wires
  - 2.5.3 chemistry and wire sizing
  - 2.5.4 testing requirements
  - 2.5.5 identification and packaging
  - 2.5.6 cast and helix
  - 2.5.7 wire finish
  - 2.5.8 choosing the correct wire size
  - 2.5.9 electrode and flux designations for SAW
  - 2.5.10 CSA classification system of carbon steel SAW flux-electrode combinations (CSA standard W48.6)
  - 2.5.11 AWS classification system of carbon steel flux-electrode combinations (AWS specification A5.17)
- 2.6 points to consider in choosing SAW consumables:
  - 2.6.1 CSA mechanical property requirements for SAW flux/electrode combinations
  - 2.6.2 SAW fluxes
  - 2.6.3 SAW fluxes classified according to method of manufacturer
  - 2.6.4 SAW fluxes classified according to effect on alloy content of the weld deposit
  - 2.6.5 typical SAW flux/electrode combination characteristics and application
  - 2.6.6 storing SAW consumables

- 2.7 describe SAW equipment maintenance and troubleshooting including:
  - 2.7.1 ongoing maintenance of equipment
  - 2.7.2 corrective measures
  - 2.7.3 troubleshooting
- 2.8 identify advantages and disadvantages of SAW
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals





## **COURSE WDA3425: MATERIALS HANDLING**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop basic skills and knowledge in the handling of materials at the work site.

**Parameters:** Access to a materials work centre, complete with basic hand and power tools, and to instruction from an individual with specialized training in the use of basic hand and power tools.

**ILM Resources:** Materials Handling 120101j

**Supporting Resources:** Apprentice Record Book: Blue Book, Fractions 120104a, Decimals 120104b, Percentage and Ratios 120104c, Geometric Formulas 120104d, Metric and Imperial Measurement 120104e

**Outcomes:** The student will:

### **1. identify safe procedures for handling and storing materials**

- 1.1 identify safe procedures for handling and storing materials including:
  - 1.1.1 personal protection
  - 1.1.2 housekeeping
  - 1.1.3 safe lifting and carrying
  - 1.1.4 safe handling of loads supported by cranes
  - 1.1.5 correct storage practices
- 1.2 determine the weight and centre of gravity of loads by:
  - 1.2.1 calculating the weight of structural steel shapes
  - 1.2.2 locating the centre of gravity
- 1.3 describe the effect that sling angles have on safe lifting
- 1.4 identify the working load limits of commonly used wire rope slings and synthetic slings
- 1.5 describe the causes and effects of shock loading on rigging; e.g., actual working loads
- 1.6 identify provincial occupational health and safety regulations regarding safety factors
- 1.7 identify and use hand signals for crane operations including:
  - 1.7.1 hand signal procedures for crane and hoist operations
  - 1.7.2 instructions to signalmen
- 1.8 describe safe procedures for lifting, hoisting and moving loads including:
  - 1.8.1 softeners
  - 1.8.2 slings
  - 1.8.3 sling attachment arrangements
  - 1.8.4 crane levelling
  - 1.8.5 planning a lift
  - 1.8.6 pick and carry operations
- 1.9 describe the purpose and use of knots, hitches and bends
- 1.10 describe the proper care and use of wire rope, synthetic rope and chains; e.g., breaking strength reductions
- 1.11 describe the correct use of plate clamps

- 1.12 describe the correct procedures for applying cable clips including:
  - 1.12.1 wire rope clips
  - 1.12.2 double saddle and bolt type rope clips
  - 1.12.3 U-bolt and saddle type rope clips
- 2. demonstrate basic competencies**
  - 2.1 demonstrate fundamental skills to:
    - 2.1.1 communicate
    - 2.1.2 manage information
    - 2.1.3 use numbers
    - 2.1.4 think and solve problems
  - 2.2 demonstrate personal management skills to:
    - 2.2.1 demonstrate positive attitudes and behaviours
    - 2.2.2 be responsible
    - 2.2.3 be adaptable
    - 2.2.4 learn continuously
    - 2.2.5 work safely
  - 2.3 demonstrate teamwork skills to:
    - 2.3.1 work with others
    - 2.3.2 participate in projects and tasks
- 3. create a transitional strategy to accommodate personal changes and build personal values**
  - 3.1 identify short-term and long-term goals
  - 3.2 identify steps to achieve goals

**COURSE WDA3430: SHIELDED METAL ARC WELDING (Part 1)**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop the knowledge and skills associated with the effects electrical current has on the arc welding process and how it applies to the welding power source.

**Parameters:** Access to a materials work centre, complete with Shielded Metal Arc Welding (SMAW) equipment, and to instruction from an individual with specialized training in welding.

**ILM Resources:** SMAW Equipment 120102a, Mild Steel Electrodes 120102b, Basic Joints and Weld Types 120102c

**Supporting Resources:** Apprentice Record Book: Blue Book, Fractions 120104a, Decimals 120104b, Percentage and Ratios 120104c, Geometric Formulas 120104d, Metric and Imperial Measurement 120104e

**Outcomes:** The student will:

**1. identify SMAW equipment**

- 1.1 define SMAW-related terms
- 1.2 describe AC and AC/DC rectified welding power sources including:
  - 1.2.1 AC transformers and AC/DC transformers/rectifiers
- 1.3 describe AC and DC generator welding power sources including:
  - 1.3.1 AC and DC generators and alternators
- 1.4 describe multi-process inverter welding power sources
- 1.5 identify welding cables and accessories for welding power sources including:
  - 1.5.1 machine installation and maintenance
  - 1.5.2 welding cables
  - 1.5.3 cable connectors and cable lugs
  - 1.5.4 electrode holders
  - 1.5.5 work lead clamps
- 1.6 identify the effect of arc length on amperage and voltage

**2. select mild steel electrodes for SMAW**

- 2.1 identify and define the terms associated with SMAW electrodes including:
  - 2.1.1 types of welding electrodes
  - 2.1.2 the coated electrode
  - 2.1.3 the SMAW process
  - 2.1.4 mechanical properties of metal
  - 2.1.5 dynamic and static loading considerations
- 2.2 identify the Canadian Standards Association (CSA) and American Welding Society (AWS) classifications and specifications for SMAW electrodes including:
  - 2.2.1 AWS classification system
  - 2.2.2 electrodes (AWS)
  - 2.2.3 current
  - 2.2.4 CSA classification system
  - 2.2.5 comparison of the AWS and CSA classification systems

- 2.3 identify the types and functions of SMAW electrode coatings including:
  - 2.3.1 core wire
  - 2.3.2 electrode coating
  - 2.3.3 grouping electrodes according to operating characteristics
  - 2.3.4 grouping electrodes according to usability characteristics
  - 2.3.5 iron powder electrodes
- 2.4 describe the functions of the slag
- 2.5 describe basic care, handling, packaging and storage procedures for these electrodes
- 2.6 identify commonly used mild steel SMAW electrodes and their applications
- 3. identify basic joints and weld types**
  - 3.1 identify the five basic joints
  - 3.2 describe the four types of welds and their acceptable dimensions
  - 3.3 identify joint and weld type variations including:
    - 3.3.1 corner joint
    - 3.3.2 edge joint
    - 3.3.3 tee joint
    - 3.3.4 lap joint
    - 3.3.5 butt joint
    - 3.3.6 position designations for groove and fillet welds
  - 3.4 outline the major considerations to be accounted for in the design of a good joint for welding
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



**COURSE WDA3435: SHIELDED METAL ARC WELDING (Part 2)**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop the knowledge and skills associated with the effects electrical current has on the arc welding process and how it applies to the welding power source.

**Parameters:** Access to a materials work centre, complete with Shielded Metal Arc Welding (SMAW) equipment, and to instruction from an individual with journeyperson certification in the welding trade.

**ILM Resources:** Shop/Lab Practices: SMAW Welds on Mild Steel Plate 120102d, Arc Cutting and Gouging 120102e

**Supporting Resources:** Apprentice Record Book: Blue Book, Fractions 120104a, Decimals 120104b, Percentage and Ratios 120104c, Geometric Formulas 120104d, Metric and Imperial Measurement 120104e

**Outcomes:** The student will:

**1. perform surface welds in the flat position and 1F, 2F, 3F, 1G and 1GF welds, using SMAW**

- 1.1 demonstrate the ability to weld surface welds (stringer beads) in the flat position, using E4914, E4310 and E4918 electrodes including:
  - 1.1.1 practical welding applications
  - 1.1.2 definition of terms
  - 1.1.3 setting the current and polarity
  - 1.1.4 positioning relative to the weld
  - 1.1.5 striking the arc
  - 1.1.6 stops and restarts
  - 1.1.7 arc length
  - 1.1.8 completing an exercise; e.g., surface welds
- 1.2 demonstrate the ability to weld fillet welds in the 1F position, using E4310 or E4311, E4914 and E4918 electrodes including:
  - 1.2.1 completing an exercise; e.g., fillet welds in the 1F (flat) position
- 1.3 demonstrate the ability to weld fillet welds in the 2F position, using E4310 or E4311, E4914 and E4918 electrodes including:
  - 1.3.1 completing an exercise; e.g., fillet welds in the 2F (horizontal) position
- 1.4 demonstrate the ability to weld fillet welds in the 3F position, using E4310 or E4311 and E4918 electrodes including:
  - 1.4.1 completing an exercise; e.g., fillet welds in the 3F (vertical) position
- 1.5 describe guided bend tests including:
  - 1.5.1 guided bend test equipment
  - 1.5.2 acceptance standards for guided bend test coupons
- 1.6 demonstrate the ability to weld groove welds on butt joints in the 1G position, root pass using E4310 or E4311, and fill and cap using E4918 filler material including:
  - 1.6.1 completing an exercise; e.g., groove welds in the 1G (flat) position

- 1.7 demonstrate the ability to weld groove welds on butt joints in the 1G position, using a 1GF test assembly using E4918 filler material complete with ¼" backing plate including:
  - 1.7.1 completing an exercise; e.g., groove welds in the 1G (flat) position with backing
- 2. gouge and cut, using the carbon arc cutting with air process and observe plasma arc cutting**
  - 2.1 describe the carbon arc cutting process including:
    - 2.1.1 air carbon arc cutting
  - 2.2 observe air carbon arc cutting including:
    - 2.2.1 setting up and operating with air carbon arc cutting
    - 2.2.2 completing an exercise; e.g., air carbon arc gouging
  - 2.3 describe the plasma arc cutting process and equipment and other arc cutting process
  - 2.4 observe plasma arc cutting including:
    - 2.4.1 completing an exercise; e.g., plasma arc cutting and gouging
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

**COURSE WDA3440: SHOP/LAB PRACTICES FOR GMAW, FCAW & SAW**

**Level:** First Period Apprenticeship

**Prerequisite:** None

**Description:** Students develop skills associated with Gas Metal Arc Welding (GMAW) and Flux Cored Arc Welding (FCAW) processes.

**Parameters:** Access to a materials work centre, complete with GMAW, FCAW and Submerged Arc Welding (SAW) equipment, and to instruction from an individual with journeyperson certification in the welding trade.

**ILM Resources:** Shop/Lab Practices: GMAW Welds on Mild Steel 120103f,  
Shop/Lab Practices: FCAW Welds on Mild Steel 120103g,  
Shop/Lab Practices: Combined GMAW and FCAW Welds on Mild Steel 120103h

**Supporting Resources:** Apprentice Record Book: Blue Book, Fractions 120104a, Decimals 120104b, Percentage and Ratios 120104c, Geometric Formulas 120104d, Metric and Imperial Measurement 120104e

**Outcomes:** The student will:

- 1. perform surface welds in the flat and horizontal positions and perform 1F, 2F, 3F, 1G, 2G and 3G position welds on mild steel**
  - 1.1 demonstrate the ability to weld stringer/weave beads in the flat and horizontal positions including:
    - 1.1.1 practical welding applications
    - 1.1.2 definition of terms
    - 1.1.3 setting GMAW welding parameters
    - 1.1.4 completing an exercise
  - 1.2 demonstrate the ability to weld 1F welds on mild steel plate including:
    - 1.2.1 fillet welds in the 1F position
    - 1.2.2 completing an exercise; e.g., fillet welds in the 1F (flat) position
  - 1.3 demonstrate the ability to weld fillet welds in the horizontal (2F) position on mild steel plate including:
    - 1.3.1 completing an exercise; e.g., fillet welds in the 2F (horizontal) position
  - 1.4 demonstrate the ability to weld fillet welds in the vertical (3F) position (downhill root and uphill fill and cover pass) on mild steel plate including:
    - 1.4.1 completing an exercise; e.g., fillet welds in the 3F (vertical) position
  - 1.5 prepare and fit up butt joints without backing
  - 1.6 demonstrate the ability to weld butt joints in the 1G position including:
    - 1.6.1 completing an exercise; e.g., butt joints in the 1G (flat) position
  - 1.7 demonstrate the ability to weld butt joints in the 2G position including:
    - 1.7.1 completing an exercise; e.g., butt joints in the 2G (horizontal) position
  - 1.8 demonstrate the ability to weld butt joints in the 3G position including:
    - 1.8.1 completing an exercise; e.g., butt joints in the 3G (vertical) position



**2. perform surface welds in the flat and horizontal positions and perform 1F, 2F, 3F, 1GF, 2GF and 3GF position welds on mild steel**

- 2.1 demonstrate the knowledge to weld stringer/weave beads in the flat and horizontal positions on mild steel plate including:
  - 2.1.1 getting started with FCAW
  - 2.1.2 setting FCAW welding parameters
  - 2.1.3 following the FCAW start-up checklist
  - 2.1.4 completing an exercise; e.g., surface welding
- 2.2 demonstrate the ability to weld 1F welds on mild steel plate including:
  - 2.2.1 completing an exercise; e.g., fillet welds in the 1F (flat) position
- 2.3 demonstrate the knowledge to weld fillet welds in the horizontal (2F) position on mild steel plate including:
  - 2.3.1 completing an exercise; e.g., fillet welds in the 2F (horizontal) position
- 2.4 demonstrate the knowledge to weld fillet welds in the vertical (3F) position on mild steel plate including:
  - 2.4.1 completing an exercise; e.g., fillet welds in the 3F (vertical) position
- 2.5 prepare and fit up butt joints with backing material
- 2.6 demonstrate the knowledge to weld butt joints in the 1G position with backing on mild steel plate including:
  - 2.6.1 completing an exercise; e.g., butt joints in the 1G (flat) position with backing
- 2.7 demonstrate the knowledge to weld butt joints in the 2G position with backing on mild steel plate including:
  - 2.7.1 completing an exercise; e.g., butt joints in the 2G (horizontal) position with backing
- 2.8 demonstrate the knowledge to weld butt joints in the 3G position with backing on mild steel plate including:
  - 2.8.1 completing an exercise; e.g., butt joints in the 3G (vertical) position with backing

**3. perform 1G, 2G and 3G position welds on mild steel**

- 3.1 demonstrate the knowledge to weld butt joints in the 1G position on mild steel, using GMAW for the root bead and FCAW fill and cap including:
  - 3.1.1 using two processes for one weld
  - 3.1.2 setting GMAW and FCAW welding parameters
  - 3.1.3 using GMAW and FCAW start-up checklist
  - 3.1.4 completing an exercise; e.g., 1G (flat position) welds on mild steel using GMAW and FCAW
- 3.2 demonstrate the knowledge to weld butt joints in the 2G position on mild steel, using GMAW for the root bead and FCAW fill and cap including:
  - 3.2.1 completing an exercise; e.g., butt joints in the 2G (horizontal) position
- 3.3 demonstrate the knowledge to weld butt joints in the 3G position on mild steel, using GMAW for the root bead and FCAW fill and cap including:
  - 3.3.1 completing an exercise; e.g., butt joints in the 3G (vertical) position

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals





## **COURSE WDA3445: OAW CUTTING PRACTICAL**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:

2.5.1 training and certification

2.5.2 interpersonal skills

2.5.3 technical skills

2.5.4 professional ethics

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

3.1.1 communicate

3.1.2 manage information

3.1.3 use numbers

3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

3.2.1 demonstrate positive attitudes and behaviours

3.2.2 be responsible

3.2.3 be adaptable

3.2.4 learn continuously

3.2.5 work safely

3.3 demonstrate teamwork skills to:

3.3.1 work with others

3.3.2 participate in projects and tasks

**COURSE WDA3450: GMAW & FCAW PRACTICAL**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:

- 2.5.1 training and certification
- 2.5.2 interpersonal skills
- 2.5.3 technical skills
- 2.5.4 professional ethics

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks



## **COURSE WDA3455: SMAW PRACTICAL**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:

- 2.5.1 training and certification
- 2.5.2 interpersonal skills
- 2.5.3 technical skills
- 2.5.4 professional ethics

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

## **COURSE WDA3460: WDA PRACTICUM COURSE A**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:

- 2.5.1 training and certification
- 2.5.2 interpersonal skills
- 2.5.3 technical skills
- 2.5.4 professional ethics

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

## **COURSE LOG1010: LOGISTICS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students identify logistics as a sector in Canada's economy, by describing related subsectors, users and providers of logistics services. Students also identify current and emerging career paths in logistics.

**Parameters:** Access to persons knowledgeable about logistics, logistics subsectors and logistics operations.

**Outcomes:** The student will:

- 1. create a health and safety plan with special emphasis on conditions and factors related to the specific pathway or series of courses**
  - 1.1 research and identify the following eight common elements of a health and safety management system:
    - 1.1.1 management, leadership and organizational commitment including policies, guidelines and responsibilities
    - 1.1.2 hazard identification and assessment
    - 1.1.3 hazard control
    - 1.1.4 worker competency and training including: technical competence, safe work practices and procedures, personal protective equipment
    - 1.1.5 work site inspection
    - 1.1.6 incident investigation
    - 1.1.7 emergency response
    - 1.1.8 management system administration including: evaluation, records and statistics, maintenance of system
  - 1.2 explain each of the elements reflecting on occupational health and safety implications
  - 1.3 define health and safety elements relevant to the world-of-work
  - 1.4 present a health and safety plan clarifying its relevance to the work world and society in general
- 2. research common processes and methods of hazard identification, assessment and control specific to the pathway or series of courses**
  - 2.1 research and identify common job site hazard identification processes
  - 2.2 research and identify common methods for assessment and control of hazards
  - 2.3 explain and demonstrate appropriate health and safety effective practices
  - 2.4 demonstrate a proactive personal commitment toward improvement of workplace health and safety including concern for others and following instructions, rules and guidelines
- 3. explain the role and significance of logistics in everyday living**
  - 3.1 describe why logistics is seen to be significant in everyday living



- 4. identify and describe subsectors of logistics:**
  - 4.1 define:
    - 4.1.1 logistics
    - 4.1.2 producers
    - 4.1.3 distributors
    - 4.1.4 consumers
- 5. describe logistics subsectors including:**
  - 5.1 warehousing and distribution
  - 5.2 traffic and transportation
  - 5.3 purchasing
  - 5.4 inventory management and control
  - 5.5 production materials movement
- 6. relationships among logistics subsectors**
  - 6.1 identify and distinguish between users and suppliers of logistic services
  - 6.2 list examples of local, provincial, national and international users and suppliers of logistics services
  - 6.3 explain the term third-party logistics and provide an example of third-party logistics users and suppliers
- 7. explain the role of logistics in the production of a simple item with respect to the item's availability and use by a satisfied customer**
  - 7.1 for a selected item, identify and describe how the logistics sector and subsectors affect the production, distribution and eventual availability and use to consumers
  - 7.2 define the terms customer service and customer satisfaction
  - 7.3 explain the importance of customer service and satisfaction in logistics
  - 7.4 list and describe examples of customer service provided within a logistics operation
  - 7.5 describe strategies and instruments used to assess levels of customer service and satisfaction
- 8. demonstrate basic competencies**
  - 8.1 demonstrate fundamental skills to:
    - 8.1.1 communicate
    - 8.1.2 manage information
    - 8.1.3 use numbers
    - 8.1.4 think and solve problems
  - 8.2 demonstrate personal management skills to:
    - 8.2.1 demonstrate positive attitudes and behaviours
    - 8.2.2 be responsible
    - 8.2.3 be adaptable
    - 8.2.4 learn continuously
    - 8.2.5 work safely
  - 8.3 demonstrate teamwork skills to:
    - 8.3.1 work with others
    - 8.3.2 participate in projects and tasks
- 9. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 9.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 9.2 create a connection between a personal inventory and occupational choices

## **COURSE LOG1020: WAREHOUSE & DISTRIBUTE 1**

**Level:** Introductory

**Prerequisite:** LOG1010: Logistics

**Description:** Students explore warehousing and distribution systems as subsectors of logistics and participate in warehousing, materials handling systems, stock placement and documentation activities.

**Parameters:** Access to one or more logistics operations.

**Outcomes:** The student will:

### **1. identify and describe the roles of warehousing and distribution in logistics**

#### **1.1 identify and describe processes involved in:**

- 1.1.1 warehousing operations
- 1.1.2 distribution operations

#### **1.2 explain the roles of warehousing and distribution in the logistics sector**

#### **1.3 distinguish between the purpose of warehousing and the purpose of distribution**

#### **1.4 explain the significance between warehousing roles and distribution roles in the logistics process**

### **2. identify, describe and demonstrate materials handling:**

#### **• systems/processes**

#### **2.1 identify and describe general and specific safety requirements in warehousing and distribution operations**

#### **2.2 identify and demonstrate safe work practices associated with:**

- 2.2.1 flow of materials
- 2.2.2 movement of equipment
- 2.2.3 Workplace Hazardous Materials Information System (WHMIS) requirements
- 2.2.4 wearing of protective clothing/personal protective equipment

#### **2.3 identify and interpret signs and symbols used in warehousing and distribution operations**

#### **2.4 identify potential hazards within a warehousing and distribution workplace**

#### **• stock placement**

#### **2.5 describe and explain the concept of materials handling**

#### **2.6 identify and describe product movement and placement procedures**

#### **2.7 demonstrate safe stock handling and moving procedures**

### **3. read, interpret and complete appropriate documentation**

#### **3.1 identify and describe the purpose of documentation used in:**

- 3.1.1 warehousing operations
- 3.1.2 distribution operations

#### **3.2 distinguish among:**

- 3.2.1 packing slips
- 3.2.2 bills of lading
- 3.2.3 advance shipment notices
- 3.2.4 distribution sheets
- 3.2.5 other available documents

#### **3.3 explain why accuracy and attention to detail are important when completing, reading and interpreting documents**

- 3.4 complete appropriate documentation in:
  - 3.4.1 warehousing situations
  - 3.4.2 distribution situations
- 3.5 identify and explain the role and impact of technology in the generation of documentation in warehousing and distribution operations
- 3.6 explain the concept of electronic data interchange
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE LOG1030: TRAFFIC & TRANSPORT 1**

**Level:** Introductory

**Prerequisite:** LOG1010: Logistics

**Description:** Students distinguish among modes, vehicles and vessels involved in transportation, identify the advantages and disadvantages of single mode and intermodal usages, and demonstrate basic skills related to map reading, technology, handling equipment and handling dangerous goods.

**Parameters:** Access to logistics-related traffic and transportation operations. A driver's licence may be required.

**Outcomes:** The student will:

**1. identify modes of transportation and the vehicles and vessels used in each mode**

- 1.1 identify and describe the role of traffic and transportation in logistics
- 1.2 distinguish between the concepts of traffic and transportation when used in logistics contexts
- 1.3 explain the advantages and disadvantages of different vehicles and vessels used in the following modes of transportation:
  - 1.3.1 air; e.g., commercial, charter
  - 1.3.2 rail
  - 1.3.3 surface; e.g., commercial, contract, hotshot
  - 1.3.4 sea
  - 1.3.5 pipeline
- 1.4 list and describe product-specific transportation equipment available
- 1.5 for a selection of products, list the:
  - 1.5.1 most appropriate mode of transportation
  - 1.5.2 product-specific requirements; e.g., refrigeration, speed, air ride trailers for delicate equipment
  - 1.5.3 other requirements; e.g., time, temperature, packing

**2. differentiate and explain the advantages and disadvantages of single mode usages and intermodal usages**

- 2.1 describe the advantages and disadvantages of using each of the following transportation systems:
  - 2.1.1 single mode
  - 2.1.2 intermodal

**3. demonstrate:**

- **map reading skills**

- 3.1 demonstrate ability to use a map to:
  - 3.1.1 identify specific locations
  - 3.1.2 trace routes
  - 3.1.3 measure distances
  - 3.1.4 identify key features

- **use of technology**

- 3.2 define and describe electronic data interchange (EDI)
- 3.3 list examples of information that may be transmitted using EDI and related technology
- 3.4 use available hardware and software



- **handling dangerous goods**
- 3.5 describe the range of goods identified as dangerous goods
- 3.6 describe the methods used to identify and label different dangerous goods
- 3.7 demonstrate safe handling of dangerous goods
- **handling equipment**
- 3.8 identify and describe basic safety procedures, practices and standards that must be followed in each mode and for each vehicle:
  - 3.8.1 on-highway standards
  - 3.8.2 off-highway standards
  - 3.8.3 air/sea freight standards
  - 3.8.4 customer safety standards
- 3.9 use personal protective equipment
- 4. demonstrate basic competencies**
- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices



## **COURSE LOG1040: PURCHASING 1**

**Level:** Introductory

**Prerequisite:** LOG1010: Logistics

**Description:** Students identify the role of purchasing, distinguish between public and private purchasing activities, perform expediting activities, and provide service to internal and external customers.

**Parameters:** Access to a purchasing, warehousing and distributing facility.

**Outcomes:** The student will:

**1. describe the role of purchasing and work performed by purchasers in logistics**

- 1.1 identify and describe the processes involved in the purchasing subsector of logistics
- 1.2 explain how and where purchasing fits in the logistics process
- 1.3 compare and contrast the purchasing process for goods and the purchasing process for services
- 1.4 identify and explain, in chart form, the line of authority for the purchase of:
  - 1.4.1 goods
  - 1.4.2 services
- 1.5 explain how and why purchasing decisions can add value/profitability to the logistics process

**2. distinguish between public and private purchasing activities**

- 2.1 identify differences and similarities between public and private purchasing activities
- 2.2 identify differences and similarities between centralized purchasing procedures and decentralized purchasing procedures

**3. differentiate between internal and external customers**

- 3.1 distinguish between internal and external customers from a purchasing perspective

**4. demonstrate basic competencies in:**

- **purchasing**

- 4.1 explain why customer satisfaction is an important factor in purchasing decisions
- 4.2 explain the concept of necessity and how it relates to the purchasing process

- **expediting**

- 4.3 demonstrate basic expediting procedures including:
  - 4.3.1 tracking progress and time of arrival of specific orders
  - 4.3.2 consulting with suppliers
  - 4.3.3 anticipating problems
  - 4.3.4 having a contingency plan
  - 4.3.5 ensuring delivery of goods

- **data handling**

- 4.4 for a given item, explain the production process(es)

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. **make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices

## **COURSE LOG1910: LOG PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performance, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE LOG2010: WAREHOUSE & DISTRIBUTE 2**

**Level:** Intermediate

**Prerequisite:** LOG1020: Warehouse & Distribute 1

**Description:** Students examine types of warehousing and develop basic skills in packaging, packing, documentation and materials handling. Students also explore bonding principles and practices and career opportunities within the warehousing and distribution sector.

**Parameters:** Access to one or more logistics operations.

**Outcomes:** The student will:

- 1. demonstrate an understanding of warehousing types, purposes and functions and of operations of warehouses, locations, organizations, processes and stock locator techniques**
  - 1.1 identify various types of warehouses and describe their specific purposes
  - 1.2 identify where different types of warehouses are usually located and explain why
  - 1.3 identify and explain the purpose of and relationship between the following areas:
    - 1.3.1 shipping
    - 1.3.2 receiving
    - 1.3.3 storage
  - 1.4 identify and explain the purpose of different systems of warehousing including:
    - 1.4.1 first in, first out (FIFO)
    - 1.4.2 last in, first out (LIFO)
    - 1.4.3 time-dated systems
    - 1.4.4 non-time dated systems
    - 1.4.5 bulk materials handling systems
    - 1.4.6 general materials handling procedures
  - 1.5 identify and explain the advantages, disadvantages and purposes of using the following stock locator systems:
    - 1.5.1 random
    - 1.5.2 fixed
    - 1.5.3 manual
    - 1.5.4 electronic
  - 1.6 demonstrate basic ability to use stock locator systems
- 2. identify and explain bonding principles and practices**
  - 2.1 explain principles and practices related to bonding including:
    - 2.1.1 purpose
    - 2.1.2 methods
    - 2.1.3 requirements
  - 2.2 list examples of goods that are usually placed in bond
  - 2.3 explain how bonding affects the flow of goods from producers to consumers



**3. demonstrate basic skills in shipment preparation including:**

- **packaging**

- 3.1 distinguish between packaging and packing systems
- 3.2 explain the purpose of packaging
- 3.3 identify and describe types of packaging; e.g., volatile corrosive inhibiting paper, blister packaging, security packaging, styrofoam, popcorn

- **packing**

- 3.4 identify and describe packing standards including:

- 3.4.1 consumer standards
- 3.4.2 industrial standards
- 3.4.3 labelling

- 3.5 demonstrate ability to pack items to:

- 3.5.1 minimize damage
- 3.5.2 meet rigours of shipment
- 3.5.3 meet regulations and standards
- 3.5.4 meet modal requirements
- 3.5.5 meet security needs

- **document selection and completion**

- 3.6 prepare and complete shipping documentation; e.g., manifests, packing slips, bills of lading, Material Safety Data Sheets (MSDS) for Workplace Hazardous Materials Information System (WHMIS) products

**4. demonstrate safety, competency and confidence in:**

- **handling materials**

- 4.1 demonstrate safe product movement and placement procedures

- **operating equipment and aids**

- 4.2 identify and describe equipment and aids used to handle various materials; e.g., forklifts, power lifts, power jacks, rollers
- 4.3 demonstrate safety, competency and confidence in operating and handling equipment and aids

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

- 5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities

## COURSE LOG2020: TRAFFIC & TRANSPORT 2

**Level:** Intermediate

**Prerequisite:** LOG1030: Traffic & Transport 1

**Description:** Students develop basic skills in tracking, route planning, scheduling, load planning and other competencies related to handling outgoing shipments, including documentation, customs (import and export), weather and climate conditions, and strategies for preventive maintenance in traffic and transportation.

**Parameters:** Access to logistics-related traffic and transportation operations. A driver's licence may be required.

**Outcomes:** The student will:

### 1. demonstrate basic skills in:

- **tracking, route planning and scheduling**

- 1.1 explain the purpose of tracking systems
- 1.2 demonstrate basic ability to use:
  - 1.2.1 tracking systems
  - 1.2.2 two-way communication devices
- 1.3 demonstrate ability to use a map to plan a route; e.g., traditional format, computerized format
- 1.4 assist in planning a route
- 1.5 assist in planning a schedule to meet customer needs and requirements

- **completing and maintaining documentation**

- 1.6 explain the purpose of and the difference between a shipping manifest and a transportation manifest
- 1.7 describe the purpose of a logbook
- 1.8 assist in maintaining a logbook
- 1.9 initiate tracing action on delayed shipments
- 1.10 initiate claim action on damaged goods

- **load planning, measuring and calculating**

- 1.11 list and explain the procedure for load planning
- 1.12 describe key factors in load planning; e.g., weight restrictions, product specific needs
- 1.13 assist in developing a load plan
- 1.14 assist in identifying potential carriers with respect to service, reliability and rates
- 1.15 measure and calculate available space in various transportation vehicles or vessels; e.g., cubic capacity, displacement, density
- 1.16 explain the relationship of the above measurements to load planning
- 1.17 apply measurement and calculation skills in load planning

- **handling equipment**

- 1.18 demonstrate basic ability to handle, operate and/or use various equipment and aids relating to traffic and transportation

- **preparing outgoing shipments**

- 1.19 demonstrate ability to:
  - 1.19.1 package goods to meet customer requirements and industry standards
  - 1.19.2 pack items to meet shipping standards

- 1.19.3 label goods and shipments appropriately
- 1.19.4 complete outgoing documentation
- 1.19.5 assist in loading outgoing shipments

## **2. identify and describe the role of:**

### **• customs, import and export**

- 2.1 identify and explain the purpose of import and export customs documentation
- 2.2 assist, where appropriate, in the preparation of import and export customs documentation by:
  - 2.2.1 initiating the clearance of incoming shipments
  - 2.2.2 maintaining a register
- 2.3 assist in maintaining an efficient filing system for all customs documentation

### **• safety standards**

- 2.4 demonstrate application of appropriate safety standards including the use of:
  - 2.4.1 wheel checks
  - 2.4.2 reflector kits
  - 2.4.3 fire extinguishers
  - 2.4.4 personal protective equipment
- 2.5 describe special procedures required to transport dangerous goods in each mode and for each vehicle or vessel
- 2.6 demonstrate special procedures and safe handling of dangerous goods

### **• weather and climate conditions**

- 2.7 explain the potential impact of weather and climate conditions on:
  - 2.7.1 modes of transportation
  - 2.7.2 vehicles and vessels
  - 2.7.3 road closures, bridge/ferry usage, seasonal road bans and weight restrictions
- 2.8 describe how a logistics operation deals with:
  - 2.8.1 annually occurring conditions
  - 2.8.2 emergency conditions; e.g., contingency planning

### **• preventive maintenance**

- 2.9 explain the purpose of preventive maintenance
- 2.10 identify, describe and demonstrate appropriate types of maintenance activities
- 2.11 describe defects and initiate corrective procedures

## **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

## **4. identify possible life roles related to the skills and content of this cluster**

- 4.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 4.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE LOG2030: PURCHASING 2**

**Level:** Intermediate

**Prerequisite:** LOG1040: Purchasing 1

**Description:** Students develop an understanding of the principles of locus of control, economies of scale, risk management, surface and hidden costs, tendering and procurement. Students also perform purchasing activities and address related factors, including budgets and inflation, within an organization's decision-making structure.

**Parameters:** Access to a purchasing, warehousing and distributing facility.

**Outcomes:** The student will:

### **1. demonstrate functional knowledge of key principles of:**

- **lines of authority**

- 1.1 define the term locus of control
- 1.2 explain how the locus of control affects purchasing decisions
- 1.3 identify and describe the lines of authority for the purchasing section of the organization
- 1.4 operate efficiently and effectively within the identified lines of authority when assisting with purchasing activities

- **economies of scale**

- 1.5 define the term economy of scale
- 1.6 explain how the use of the economy of scale principle adds value to a company
- 1.7 list examples of an economy of scale in one or more purchasing activities

- **risk management**

- 1.8 define the term risk management including:
  - 1.8.1 expense items
  - 1.8.2 capital equipment
  - 1.8.3 production materials
- 1.9 identify and describe the risks associated with purchasing decisions; e.g., company liability, personal liability or Workers' Compensation Board (WCB) coverage
- 1.10 identify and chart lines of authority, responsibility and accountability in the risk management process
- 1.11 identify and describe basic strategies used to manage and minimize risk when purchasing decisions are made

- **budgeting**

- 1.12 explain the purpose or function of savings, capital and operational accounts
- 1.13 identify individuals responsible for:
  - 1.13.1 savings
  - 1.13.2 budget centre usage
  - 1.13.3 capital accounts
  - 1.13.4 operational accounts
- 1.14 demonstrate a basic understanding of cost accounting principles
- 1.15 explain the effect of inflation on the budget
- 1.16 explain the effect of the budget on inflation
- 1.17 identify and describe the process by which spending decisions are made

**2. distinguish between surface and hidden costs**

2.1 define and provide examples of:

2.1.1 surface and hidden costs

2.1.2 initial and lifetime costs

2.2 explain how total ownership costs and other costs affect purchasing decisions; e.g., insurance, gas, mileage, maintenance

**3. demonstrate basic abilities relating to:**

- **purchasing**

3.1 explain the concept of best buy; e.g., size, quantity, quality, cost

- **decision making**

3.2 explain the necessity to balance quality, cost and time in making purchasing decisions

- **tendering**

3.3 define the term tendering

3.4 identify and describe the tendering process

- **procurement**

3.5 define the term procurement

3.6 explain the purpose of specification writing in purchasing activities

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

4.1.1 communicate

4.1.2 manage information

4.1.3 use numbers

4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

4.2.1 demonstrate positive attitudes and behaviours

4.2.2 be responsible

4.2.3 be adaptable

4.2.4 learn continuously

4.2.5 work safely

4.3 demonstrate teamwork skills to:

4.3.1 work with others

4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE LOG2040: INVENTORY MANAGEMENT 1**

**Level:** Intermediate

**Prerequisite:** LOG1010: Logistics

**Description:** Students identify the role of inventory management and control, and participate in and demonstrate basic abilities to manage and control inventory.

**Parameters:** Access to inventory management and control operations.

**Outcomes:** The student will:

**1. describe the roles of inventory management and control in logistics**

- 1.1 explain the role of inventory management and control in the logistics process
- 1.2 explain the purpose of and need for inventory management and control in the following contexts:
  - 1.2.1 security
  - 1.2.2 control
  - 1.2.3 reordering

**2. describe and distinguish among methods to classify and categorize materials**

- 2.1 list and describe systems available to manage and control inventory including:
  - 2.1.1 manual
  - 2.1.2 electronic
  - 2.1.3 other
- 2.2 identify and describe commonly used classification systems such as:
  - 2.2.1 Standard Industrial Classification Code
  - 2.2.2 harmonized system
  - 2.2.3 North Atlantic Treaty Organization
  - 2.2.4 military
  - 2.2.5 federal stock number
- 2.3 describe the purpose of:
  - 2.3.1 warehouse keeper's records
  - 2.3.2 cycle count sheets
- 2.4 demonstrate basic ability to use one or more classification systems

**3. identify and describe the purpose of key principles of inventory management and control**

- 3.1 list and describe inventory control principles including:
  - 3.1.1 ABC analysis
  - 3.1.2 minimum/maximum systems
  - 3.1.3 economic order quantity
  - 3.1.4 materials requirements planning
  - 3.1.5 consignment inventory
  - 3.1.6 just-in-time
- 3.2 explain the purpose of quality control systems
- 3.3 describe quality control systems and procedures used in inventory management and control operations

- 4. use basic technology, spreadsheets and databases to input, read and interpret inventory management and control**
  - 4.1 demonstrate basic ability to:
    - 4.1.1 access inventory information
    - 4.1.2 input inventory information
    - 4.1.3 interpret information from various databases
- 5. describe and demonstrate product movement and replenishment strategies**
  - 5.1 demonstrate basic inventory management and control procedures; e.g., picking, reordering
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. identify possible life roles related to the skills and content of this cluster**
  - 7.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 7.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE LOG2910: LOG PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE LOG2920: LOG PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE LOG3010: WAREHOUSE & DISTRIBUTE 3**

**Level:** Advanced

**Prerequisite:** LOG2010: Warehouse & Distribute 2

**Description:** Students develop an understanding and competencies related to stock movement and placement procedures, product tracking and the use of automated warehouse systems. Students also develop competencies in labelling, containerizing and palletizing items.

**Parameters:** Access to one or more logistics operations.

**Outcomes:** The student will:

### **1. demonstrate an understanding of:**

- **stock movement and placement procedures and practices**

- 1.1 identify and describe stock movement and placement procedures and practices
- 1.2 identify and correct errors in documentation
- 1.3 regularly review stocks and flow
- 1.4 anticipate product movement issues, develop contingency plans and implement solutions, where appropriate
- 1.5 demonstrate safe product movement and placement procedures and practices

- **product tracking**

- 1.6 identify and describe product tracking services
- 1.7 identify and describe various tracking procedures
- 1.8 demonstrate ability to use tracking technology; e.g., bar codes/reader/scanner, microfiche, CD-ROM, monitors, visual readers, locator systems

- **equipment operations standards**

- 1.9 identify and describe warehouse equipment operations standards; e.g., internal standards (department, company), external standards (governmental, national)

- **automated warehouse systems**

- 1.10 explain the advantages and disadvantages of using automated warehouse systems
- 1.11 demonstrate ability to safely use automated systems; e.g., conveyor systems, pickers, scaling/weighing devices, storage and retrieval systems

### **2. demonstrate competencies in:**

- **labelling**

- 2.1 identify product and/or shipment labelling needs
- 2.2 demonstrate ability to read, interpret, select and affix appropriate labels; e.g., shipping instructions, content identification, Workplace Hazardous Materials Information System (WHMIS) needs, quantity, mass, handling instructions; e.g., fragile, this side up

- **containerization**

- 2.3 explain the purpose of containerization
- 2.4 demonstrate ability to safely operate wrapping equipment and materials; e.g., shrink-wrap, nets, nylons
- 2.5 demonstrate ability to prepare containers for shipment; e.g., label, wrap

- **palletizing**

- 2.6 explain the purpose of palletizing items; e.g., warehouse storage, ease of handling (manual, automated), outgoing and incoming shipments

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

**4. create a transitional strategy to accommodate personal changes and build personal values**

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

## **COURSE LOG3020: TRAFFIC & TRANSPORT 3**

**Level:** Advanced

**Prerequisite:** LOG2020: Traffic & Transport 2

**Description:** Students explore transport regulations and licensing and develop competency in planning a route and developing contingency plans.

**Parameters:** Access to logistics-related traffic and transportation operations. A driver's license may be required.

**Outcomes:** The student will:

### **1. demonstrate competency in planning a route and developing contingency plans**

- 1.1 plan a route using a:
  - 1.1.1 traditional map
  - 1.1.2 computerized format
- 1.2 develop contingency plans, where appropriate

### **2. demonstrate a basic understanding of:**

#### **• equipment handling certification requirements**

- 2.1 identify licensing or certification requirements for each item of transportation equipment or aid
- 2.2 initiate procedures to obtain a license or certificate, where appropriate and necessary
- 2.3 demonstrate consistent ability to safely handle, operate and use various equipment aids relating to traffic and transportation

#### **• vendor and carrier licensing and training for dangerous goods**

- 2.4 identify and list key:
  - 2.4.1 transportation regulations and licensing requirements
  - 2.4.2 weight restrictions
  - 2.4.3 seasonal restrictions
  - 2.4.4 jurisdictional restrictions and requirements
- 2.5 list licensing required to operate different vehicles and vessels
- 2.6 identify and ensure that the vendor and carrier has the necessary licensing and training to handle and transport dangerous goods
- 2.7 demonstrate consistently the safe handling, storage and transportation of dangerous goods

#### **• rates and tariffs**

- 2.8 identify and describe transportation rates and tariffs
- 2.9 demonstrate ability to compare present proposed rates to the previous contract rate
- 2.10 assist in determining the contracted rate taking into account:
  - 2.10.1 market prices
  - 2.10.2 costs of the supplier
  - 2.10.3 customer needs

#### **• liabilities**

- 2.11 identify liability assumed by different modes of carriers
- 2.12 identify and describe:
  - 2.12.1 Workers' Compensation Board requirements
  - 2.12.2 insurance requirements

- 2.13 identify damage claimable:
  - 2.13.1 items
  - 2.13.2 procedures
  - 2.13.3 documents
- 2.14 assist in completing damage claim documents
- 2.15 identify and report shipment over/shorts
- 2.16 explain the use of bill of lading and liabilities, and freight on board
- 2.17 describe applications of freight on board statements; e.g., payment for carriage, selection of courier, limits of liability

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. create a transitional strategy to accommodate personal changes and build personal values**

- 4.1 identify short-term and long-term goals
- 4.2 identify steps to achieve goals



## **COURSE LOG3030: PURCHASING 3**

**Level:** Advanced

**Prerequisite:** LOG2030: Purchasing 2

**Description:** Students develop knowledge about contract and business law, supplier quality assurance and performance management. Students also develop negotiation skills and an appreciation for the importance of professional ethics.

**Parameters:** Access to inventory management and control operations.

**Outcomes:** The student will:

### **1. identify and explain key principles of:**

- **contract and business law**

- 1.1 identify key principles of contract and business law; e.g., liens, waivers, liability, negligence
- 1.2 explain the impact of contract and business law on purchasing activities
- 1.3 identify and describe legislation that affects purchasing activities; e.g., *Sales of Goods Act*
- 1.4 identify purchasing activities that are in alignment with contract and business law and relevant legislation

- **supplier quality assurance**

- 1.5 explain the principles of Supplier Quality Assurance (SQA)
- 1.6 identify and describe the impact of SQA on:
  - 1.6.1 delivery
  - 1.6.2 equality
  - 1.6.3 invoicing
  - 1.6.4 damaged goods
  - 1.6.5 customer service

- **performance management**

- 1.7 explain the principle of performance management
- 1.8 identify and describe the purpose of performance management in purchasing activities
- 1.9 identify and describe performance management models; e.g., total quality management, quality teams
- 1.10 evaluate performance management models employed using appropriate assessment tools and instruments

### **2. demonstrate basic understanding and skills in professional ethics**

- 2.1 define the term professional ethics
- 2.2 identify and explain the role of professional ethics in the purchasing process
- 2.3 define and give examples of conflict of interest
- 2.4 explain the role of the:
  - 2.4.1 Purchasing Management Association of Canada
  - 2.4.2 National Institute of Governmental Purchasing
  - 2.4.3 International Federation of Purchasing and Materials Management
- 2.5 identify and describe the requirements for designation as a:
  - 2.5.1 Certified Professional Purchaser
  - 2.5.2 Certified Professional Public Buyer
  - 2.5.3 Certified Professional Purchasing Officer

**3. demonstrate negotiation skills**

- 3.1 define the term negotiate
- 3.2 explain the purpose of negotiating in purchasing activities
- 3.3 demonstrate negotiating skills in purchasing activities

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

## **COURSE LOG3040: INVENTORY MANAGEMENT 2**

**Level:** Advanced

**Prerequisite:** LOG2040: Inventory Management 1

**Description:** Students demonstrate competencies related to product movement and replenishment strategies, budgeting, internal controls and asset recovery.

**Parameters:** Access to inventory management and control operations.

**Outcomes:** The student will:

### **1. identify, describe and apply key principles of:**

- **product movement and replenishment strategies**

- 1.1 explain the purpose of product movement and replenishment strategies
- 1.2 identify and describe product movement and replenishment strategies; e.g., degree, level, complexity
- 1.3 demonstrate basic product movement and replenishment strategies in inventory management and control activities

- **budget procedures**

- 1.4 explain the impact of inventory management on the budget procedure
- 1.5 identify key budget procedures
- 1.6 explain how inventory management affects:
  - 1.6.1 product quality
  - 1.6.2 cost control

- **internal controls**

- 1.7 explain the purpose of internal inventory controls; e.g., security
- 1.8 identify and describe the internal inventory controls in effect; e.g., managerial practices, inventory flow, paper trail
- 1.9 demonstrate basic ability to use and maintain internal inventory controls

- **asset recovery**

- 1.10 explain the concept of asset recovery
- 1.11 identify and describe strategies for asset recovery; e.g., asset disposition, recycling, reuse, recovery
- 1.12 assist in asset recovery activities

### **2. use basic technology to affect inventory management and control**

- 2.1 demonstrate ability to manage and control inventory using:

- 2.1.1 manual records
- 2.1.2 microfiche
- 2.1.3 spreadsheets
- 2.1.4 database systems
- 2.1.5 word processors

- 2.2 demonstrate ability to:

- 2.2.1 access inventory information
- 2.2.2 input inventory information
- 2.2.3 interpret information from various databases

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

**4. create a transitional strategy to accommodate personal changes and build personal values**

4.1 identify short-term and long-term goals

4.2 identify steps to achieve goals

## **COURSE LOG3910: LOG PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

## **COURSE LOG3920: LOG PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE MEC1010: MODES & MECHANISMS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students research, design, build and test a model of a transportation vehicle, using a simple power source, common materials and tools.

**Parameters:** Access to tools and fasteners commonly used in the trade.

**Outcomes:** The student will:

**1. demonstrate the safe use of tools and follow established laboratory procedures**

- 1.1 demonstrate knowledge of and follow safety rules and guidelines related to the use of basic hand and power tools
- 1.2 identify the hazards associated with the use of:
  - 1.2.1 compressed gases
  - 1.2.2 liquids under pressure
  - 1.2.3 flammable materials
  - 1.2.4 components under tension

**2. list and describe operating systems and structures common to all modes of transportation**

- 2.1 identify a transportation mode that can be used to move passengers or goods in the following environments:
  - 2.1.1 terrestrial
  - 2.1.2 marine
  - 2.1.3 atmospheric
  - 2.1.4 space
- 2.2 describe, in a given environment, what forces must be overcome to start and keep a vehicle/craft in motion
- 2.3 list and describe the function of the following systems:
  - 2.3.1 propulsion
  - 2.3.2 guidance
  - 2.3.3 control
  - 2.3.4 suspension
  - 2.3.5 structural
  - 2.3.6 solar and wind
- 2.4 describe and demonstrate how energy produces motion using:
  - 2.4.1 gravity
  - 2.4.2 elastic or spring materials under tension
  - 2.4.3 compressed gases
  - 2.4.4 liquids under pressure
  - 2.4.5 electromagnetic combustion
- 2.5 identify and compare the guidance and control mechanisms that are used in connection with a:
  - 2.5.1 land vehicle
  - 2.5.2 marine craft
  - 2.5.3 aircraft
  - 2.5.4 spacecraft

- 2.6 identify and compare the means by which a vehicle or craft is supported:
  - 2.6.1 on land
  - 2.6.2 in air
  - 2.6.3 in water or space
- 2.7 identify the types of structures and materials that are used to support vehicular systems to provide maximum safety and performance
- 3. research, design, build and test a concept vehicle**
  - 3.1 research, design and construct a vehicle or craft for a predetermined use
  - 3.2 identify an appropriate measurement technique used to assess factors including:
    - 3.2.1 speed
    - 3.2.2 pulling power
    - 3.2.3 payload
    - 3.2.4 efficiency
  - 3.3 describe operation and construction of the transportation vehicle
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices



## **COURSE MEC1015: MECHANICS TOOLS & MATERIALS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop knowledge, skills and attitudes in the safe use of specialty hand tools, measuring tools and fasteners.

**Parameters:** Access to tools and fasteners commonly used in the trade.

**Outcomes:** The student will:

- 1. create a health and safety plan with special emphasis on conditions and factors related to the specific pathway or series of courses**
  - 1.1 research and identify the following eight common elements of a health and safety management system:
    - 1.1.1 management, leadership and organizational commitment including policies, guidelines and responsibilities
    - 1.1.2 hazard identification and assessment
    - 1.1.3 hazard control
    - 1.1.4 worker competency and training including: technical competence, safe work practices and procedures, personal protective equipment
    - 1.1.5 work site inspection
    - 1.1.6 incident investigation
    - 1.1.7 emergency response
    - 1.1.8 management system administration including: evaluation, records and statistics, maintenance of system
  - 1.2 explain each of the elements reflecting on occupational health and safety implications
  - 1.3 define health and safety elements relevant to the world-of-work
  - 1.4 present a health and safety plan clarifying its relevance to the work world and society in general
- 2. research common processes and methods of hazard identification, assessment and control specific to the pathway or series of courses**
  - 2.1 research and identify common job site hazard identification processes
  - 2.2 research and identify common methods for assessment and control of hazards
  - 2.3 explain and demonstrate appropriate health and safety effective practices
  - 2.4 demonstrate a proactive personal commitment toward improvement of workplace health and safety including concern for others and following instructions, rules and guidelines
- 3. identify, describe and demonstrate the safe and correct use of shop procedures and equipment**
  - 3.1 demonstrate knowledge of and follow safety rules and guidelines related to the use of specialty hand and measuring tools, as well as shop/laboratory routines
  - 3.2 identify the hazards with the use of:
    - 3.2.1 adhesives
    - 3.2.2 sealers
- 4. identify, describe and demonstrate the safe and correct use of power and specialty hand tools used in the trade**
  - 4.1 identify and describe the following common specialty tools:
    - 4.1.1 tube flare kit
    - 4.1.2 tubing cutter
    - 4.1.3 tubing bender
    - 4.1.4 twist drills

- 4.1.5 reamers
- 4.1.6 taps and tap handles
- 4.1.7 dies and diestock
- 4.1.8 stud extractors
- 4.1.9 pneumatic tools
- 4.1.10 drill press
- 4.1.11 pedestal grinder
- 4.1.12 vises
- 4.1.13 hack saws

**5. identify, describe and demonstrate the safe and correct use of measuring tools used in the trade**

5.1 describe and use the following common measuring tools:

- 5.1.1 steel rule
- 5.1.2 feeler blades
- 5.1.3 vernier, dial and digital slide calipers
- 5.1.4 micrometer
- 5.1.5 dial indicator
- 5.1.6 transfer gauges
- 5.1.7 Plastigauge™
- 5.1.8 torque wrench
- 5.1.9 pull scale

**6. list and describe fastening devices used in the trade**

6.1 identify and describe the following:

- 6.1.1 threaded fasteners
- 6.1.2 bolt grades
- 6.1.3 bolt identification
- 6.1.4 nuts
- 6.1.5 washers
- 6.1.6 torquing techniques
- 6.1.7 snap rings and clips
- 6.1.8 set screws
- 6.1.9 keys
- 6.1.10 splines
- 6.1.11 pins
- 6.1.12 plastic trim fasteners

6.2 describe the use of:

- 6.2.1 adhesives
- 6.2.2 sealers

**7. demonstrate proper techniques when using fastening devices**

- 7.1 select or modify a plan for a simple product that will meet a defined need
- 7.2 identify and select the appropriate tools, materials and processes required to make the product
- 7.3 list the steps that are required to make a product in a safe and logical order
- 7.4 demonstrate the following tasks:
  - 7.4.1 tap a blind hole
  - 7.4.2 cut threads with a die and diestock
  - 7.4.3 repair threads using thread-restoring inserts
  - 7.4.4 broken fastener removal
  - 7.4.5 convert numbers between decimals and fractions
  - 7.4.6 identify linear measurements in imperial and SI units
  - 7.4.7 identify torque measurements in imperial and SI units

**8. demonstrate basic competencies**

8.1 demonstrate fundamental skills to:

- 8.1.1 communicate
- 8.1.2 manage information
- 8.1.3 use numbers
- 8.1.4 think and solve problems

8.2 demonstrate personal management skills to:

- 8.2.1 demonstrate positive attitudes and behaviours
- 8.2.2 be responsible
- 8.2.3 be adaptable
- 8.2.4 learn continuously
- 8.2.5 work safely

8.3 demonstrate teamwork skills to:

- 8.3.1 work with others
- 8.3.2 participate in projects and tasks

**9. make personal connections to the cluster content and processes to inform possible pathway choices**

- 9.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 9.2 create a connection between a personal inventory and occupational choices



## **COURSE MEC1020: VEHICLE SERVICE & CARE**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop the knowledge, skills and attitudes to care for and service a motor vehicle.

**Parameters:** Access to commercially available products and related resources.

**Note:** Customer work must be checked by a qualified technician.

**Outcomes:** The student will:

- 1. demonstrate the safe use of tools and follow established laboratory procedures**
  - 1.1 demonstrate knowledge of and follow practices that promote safety and protect the environment
- 2. develop a preventive maintenance service schedule for a vehicle**
  - 2.1 explain why preventive maintenance can:
    - 2.1.1 avoid expensive repairs
    - 2.1.2 improve reliability and safety
    - 2.1.3 improve efficiency
    - 2.1.4 extend the life of the vehicle
  - 2.2 identify and locate a vehicle's major mechanical and structural components that need regular service and care
  - 2.3 identify and safely use common hand tools and equipment
  - 2.4 identify from the owner's manual the recommended:
    - 2.4.1 type and grade of motor oil
    - 2.4.2 type of engine coolant
    - 2.4.3 brake fluid
    - 2.4.4 power steering fluid
    - 2.4.5 transmission fluid
    - 2.4.6 type of filters
  - 2.5 identify potential trouble signs including:
    - 2.5.1 warning lights or gauges
    - 2.5.2 unusual odours or noises
    - 2.5.3 burning oil
    - 2.5.4 leaks
    - 2.5.5 other
- 3. inspect and service a vehicle according to the vehicle service schedule**
  - 3.1 identify the components of a work order
  - 3.2 prepare a repair order
  - 3.3 prepare a service schedule using the owner's manual or a shop manual to determine when to:
    - 3.3.1 change lubrication fluids
    - 3.3.2 replace filters
    - 3.3.3 drain and replace coolants
    - 3.3.4 lubricate body components
    - 3.3.5 inspect and lubricate suspension and steering joints
    - 3.3.6 inspect brake linings



- 3.3.7 repack wheel bearings
- 3.3.8 rotate tires
- 3.3.9 other
- 3.4 demonstrate a visual inspection of:
  - 3.4.1 fluid levels
  - 3.4.2 hose and belt condition
  - 3.4.3 tire pressure and condition
  - 3.4.4 lights and accessories
  - 3.4.5 battery condition
- 3.5 demonstrate the procedure used to:
  - 3.5.1 replace engine motor oil, coolant and filters
  - 3.5.2 lubricate chassis and body parts
  - 3.5.3 clean and check the battery condition
  - 3.5.4 rotate tires
  - 3.5.5 check tire pressure
  - 3.5.6 dispose of used fluids and parts
  - 3.5.7 remove and replace a tire and rim from a vehicle
  - 3.5.8 boost (jump-start) a vehicle
  - 3.5.9 demonstrate basic troubleshooting on a stalled vehicle
- 4. clean and apply a protective coating to the exterior and interior surfaces of a vehicle for use or storage**
  - 4.1 describe what steps should be taken when a vehicle is stored for a period of time
  - 4.2 explain why it is necessary to shelter or protect a vehicle from:
    - 4.2.1 the sun's radiation
    - 4.2.2 salt
    - 4.2.3 heat and cold
    - 4.2.4 other
  - 4.3 identify and demonstrate the use of products that can be safely used to:
    - 4.3.1 clean a painted surface
    - 4.3.2 degrease components
    - 4.3.3 wax and polish a surface
    - 4.3.4 other; e.g., chip protection
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks

- 6. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices



## **COURSE MEC1040: ENGINE FUNDAMENTALS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students investigate and describe operating principles, construction and applications of engines.

**Parameters:** Access to engine measuring tools, related resources and engine units.

**Outcomes:** The student will:

**1. demonstrate the safe use of tools and follow established laboratory procedures**

- 1.1 demonstrate knowledge of and follow laboratory safety procedures
- 1.2 describe the hazards associated with:
  - 1.2.1 gasoline and other flammable liquids
  - 1.2.2 exhaust gases
  - 1.2.3 hot coolants and liquids

**2. compare operating principles of two- and four-cycle piston engines**

- 2.1 identify and use measuring tools in both imperial and metric systems of measurement including:
  - 2.1.1 steel rule
  - 2.1.2 callipers and dividers
  - 2.1.3 micrometer
  - 2.1.4 dial indicator
  - 2.1.5 torque wrench
  - 2.1.6 pressure gauges
  - 2.1.7 other
- 2.2 identify and use fasteners associated with engines (measurements in both imperial and metric) including:
  - 2.2.1 bolts, studs and nuts
  - 2.2.2 washers
  - 2.2.3 pins
  - 2.2.4 keys
  - 2.2.5 snap rings
  - 2.2.6 machine screws
  - 2.2.7 other
- 2.3 describe the effects of heating a gas in an enclosed space
- 2.4 identify the types of fuels commonly used in combustion engines
- 2.5 describe the difference between an internal and external combustion engine
- 2.6 identify the type of engines and fuels that are used for air, land, sea and space applications

**3. determine the condition of an internal combustion engine**

- 3.1 locate and use resources related to:
  - 3.1.1 service bulletins and repair manuals
  - 3.1.2 engine specifications documentation
  - 3.1.3 parts numbers and assembly procedures
- 3.2 identify and label the major parts of a reciprocating engine
- 3.3 demonstrate how reciprocating motion is converted to rotary motion
- 3.4 explain the difference between a two- and a four-stroke cycle engine

- 3.5 explain the purpose of the following support systems:
  - 3.5.1 cooling
  - 3.5.2 lubrication
  - 3.5.3 ignition
  - 3.5.4 fuel
  - 3.5.5 exhaust
- 3.6 demonstrate how engines differ according to their:
  - 3.6.1 number of cylinders
  - 3.6.2 design
  - 3.6.3 size
  - 3.6.4 make and model
  - 3.6.5 other
- 3.7 appraise the condition of an engine
- 4. describe the by-products of combustion and their impact on the environment**
  - 4.1 describe the by-products of combustion and their effects on personal health and the environment
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 6.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 6.2 create a connection between a personal inventory and occupational choices



## **COURSE MEC1090: ELECTRICAL FUNDAMENTALS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students identify and describe the operating principles and applications of electricity.

**Parameters:** Access to a multimeter, a battery hydrometer, a battery charger, related battery tools and electrical supplies.

**Outcomes:** The student will:

**1. demonstrate the safe use of electrical tools and equipment and follow established laboratory procedures**

- 1.1 safely use tools/equipment and follow established laboratory procedures
- 1.2 identify causes of battery explosion/acid burns
- 1.3 describe electrical shock/burns/fires
- 1.4 outline a plan of action when an accident occurs

**2. apply electrical principles and concepts to test electrical circuits and components**

- 2.1 describe magnetic attraction and repulsion
- 2.2 produce a temporary and permanent magnet
- 2.3 find the polarity of an electromagnet
- 2.4 describe the electron theory in relation to the parts of an atom
- 2.5 describe production of electricity in the following ways:
  - 2.5.1 chemically
  - 2.5.2 thermally
  - 2.5.3 photoelectrically
  - 2.5.4 piezoelectrically
  - 2.5.5 electromagnetically
- 2.6 explain the difference between AC and DC current
- 2.7 identify and label the parts of a simple circuit
- 2.8 identify the physical form and circuit symbol of a:
  - 2.8.1 light
  - 2.8.2 motor
  - 2.8.3 heating element
  - 2.8.4 solenoid
  - 2.8.5 fuse
  - 2.8.6 other
- 2.9 describe what conditions create:
  - 2.9.1 an open circuit
  - 2.9.2 a closed circuit
  - 2.9.3 a short circuit
  - 2.9.4 a grounded circuit
- 2.10 describe how a frame ground circuit operates on a motor vehicle

- 2.11 define what is meant by:
  - 2.11.1 amperage
  - 2.11.2 voltage
  - 2.11.3 resistance
- 2.12 compare the similarity between electrical and fluid energy
- 2.13 construct and compare a series and a parallel circuit
- 2.14 measure, with appropriate meters, the resistance, voltage and amperage in a given circuit
- 2.15 describe the relationship that exists among the amperage, voltage and resistance within a circuit
- 2.16 describe the condition of a battery and service

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**4. make personal connections to the cluster content and processes to inform possible pathway choices**

- 4.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 4.2 create a connection between a personal inventory and occupational choices

## **COURSE MEC1110: PNEUMATICS & HYDRAULICS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students identify and describe the operating principles and applications of pneumatic and hydraulic systems.

**Parameters:** Access to related pneumatic and hydraulic units and resources.

**Outcomes:** The student will:

- 1. demonstrate the safe use of pneumatic and hydraulic tools and equipment and follow established laboratory procedures**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 list hazards related to working with fluids and gases under pressure and related equipment
- 2. compare operating principles of pneumatic and hydraulic systems**
  - 2.1 state why fluid systems are widely used in transportation and power applications
  - 2.2 contrast hydraulic and pneumatic systems
  - 2.3 demonstrate how pressure affects a liquid and a gas in an enclosed space
  - 2.4 describe what units are used to measure pressure in a fluid
  - 2.5 describe what units are used to calculate the flow of fluid past a point
  - 2.6 demonstrate the relationship between flow rate and pressure in a fluid system
  - 2.7 describe how a small force can be multiplied in a fluid system
  - 2.8 contrast the action of common pumps and compressors including:
    - 2.8.1 impeller
    - 2.8.2 gear
    - 2.8.3 piston
    - 2.8.4 diaphragm
    - 2.8.5 vane type
  - 2.9 locate examples of these pumps and compressors in a motor vehicle or some other power system
- 3. apply principles and concepts of pneumatics and hydraulics to test and operate a pneumatic and/or hydraulic system**
  - 3.1 observe and demonstrate the use of valves to control:
    - 3.1.1 direction of flow
    - 3.1.2 pressure of fluids
    - 3.1.3 flow rate of fluids
  - 3.2 locate valves on a given vehicle
  - 3.3 demonstrate how fluids under pressure can be used to move a:
    - 3.3.1 motor
    - 3.3.2 cylinder
    - 3.3.3 diaphragm
  - 3.4 identify and operate pneumatic and hydraulic units on a given vehicle
  - 3.5 describe the principles in a fluid system such as:
    - 3.5.1 hydraulic hoist
    - 3.5.2 hydraulic brakes

- 3.6 demonstrate how to check and adjust fluid levels
- 3.7 demonstrate how to double and single flare a steel line and indicate when each flare type should be used
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE MEC1130: MECHANICAL SYSTEMS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students identify and describe the operating principles and applications of mechanisms used to transmit and control mechanical energy.

**Parameters:** Access to examples of mechanical units and related resources.

**Outcomes:** The student will:

**1. demonstrate the safe use of tools and follow established laboratory procedures**

- 1.1 demonstrate knowledge of and follow laboratory safety procedures
- 1.2 explain dangers associated with rotating/moving components

**2. describe principles and concepts related to the use of mechanisms to control and transmit force and motion in a mechanical system**

- 2.1 describe the application of mechanical systems that are found in all aspects of human endeavour
- 2.2 demonstrate the use of simple machines to change the:
  - 2.2.1 direction in which a force acts
  - 2.2.2 size of the force
  - 2.2.3 place where the force acts
- 2.3 identify and describe a mechanism that produces:
  - 2.3.1 linear motion
  - 2.3.2 reciprocating motion
  - 2.3.3 oscillating motion
  - 2.3.4 rotary motion
  - 2.3.5 other
- 2.4 use a graph to describe the action of a cam as it changes rotary motion to linear motion
- 2.5 explain the difference between direct and indirect transmission of power
- 2.6 describe the purpose and types of:
  - 2.6.1 shafts
  - 2.6.2 couplers
  - 2.6.3 universal joints
  - 2.6.4 pins
  - 2.6.5 others

**3. apply basic principles and concepts of mechanical systems**

- 3.1 demonstrate the use of simple machines to:
  - 3.1.1 start and stop motion
  - 3.1.2 change directions
  - 3.1.3 increase or decrease speed
  - 3.1.4 increase or decrease torque
- 3.2 describe the relationship between torque, velocity and gear ratios
- 3.3 explain why friction has both positive and negative attributes
- 3.4 compare the coefficient of friction between two different materials
- 3.5 describe how friction can be increased or decreased in a mechanical system
- 3.6 calculate the mechanical advantage of one or more mechanisms to determine the efficiency of the system



- 3.7 explain how mechanical energy can be changed to:
  - 3.7.1 heat energy
  - 3.7.2 electrical energy
  - 3.7.3 fluid energy
  - 3.7.4 other
- 3.8 list, observe and service mechanical systems on a given vehicle
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices

## **COURSE MEC1150: RIDE & CONTROL SYSTEMS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop a basic knowledge of ride and control systems associated with vehicles.

**Parameters:** Access to a floor jack, safety stands, a suspension/steering system and related resources.

**Outcomes:** The student will:

- 1. demonstrate the safe use of tools and follow established laboratory procedures**
  - 1.1 demonstrate knowledge of and follow established safety procedures
- 2. describe the purpose, operation and interdependent nature of ride and control systems**
  - 2.1 locate and identify the components that are used to provide:
    - 2.1.1 stopping action
    - 2.1.2 directional control
    - 2.1.3 rolling action
    - 2.1.4 stabilization
    - 2.1.5 cushioning
    - 2.1.6 other actions
  - 2.2 describe methods of directional control on land, sea and air vehicles/crafts
  - 2.3 describe the method of steering used by most wheeled vehicles
  - 2.4 explain the purpose of the parts of a conventional steering system; e.g., steering gear, tie rod end, idler arm, pitman arm and steering knuckle
  - 2.5 list the parts of a steering system that are subject to wearing or bending
  - 2.6 identify and describe the action of the following types of braking systems and possible application:
    - 2.6.1 mechanical
    - 2.6.2 hydraulic
    - 2.6.3 electric
    - 2.6.4 air
    - 2.6.5 other
  - 2.7 explain the difference between the braking action of a disc brake and the breaking action of a drum brake
  - 2.8 determine how tires and tracks vary according to:
    - 2.8.1 road or terrain use
    - 2.8.2 seasonal use
    - 2.8.3 methods of construction
  - 2.9 show how to examine the wear pattern on a tire to determine whether it has been:
    - 2.9.1 overinflated or underinflated
    - 2.9.2 improperly aligned
    - 2.9.3 subject to suspension faults
    - 2.9.4 balanced improperly

**3. inspect and service ride and control systems**

- 3.1 check and complete a tire repair
- 3.2 complete a tire balance
- 3.3 identify tire wear problems
- 3.4 inspect and repack wheel bearing
- 3.5 list and identify the parts of a braking system that are subject to wearing, seizing or leaking

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE MEC1160: STRUCTURES & MATERIALS**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students identify the types of materials and components used in vehicle construction.

**Parameters:** Access to a vehicle, hand tools, fasteners, materials and related resources.

**Outcomes:** The student will:

- 1. demonstrate the safe use of tools and follow established laboratory procedures**
  - 1.1 state health and environmental issues related to the replacement and repair of coated surfaces
  - 1.2 state how hazardous materials are handled and disposed of
- 2. explain the relationship between the function of a vehicle and the materials used in its construction**
  - 2.1 outline the historical development of materials used in transportation vehicles
  - 2.2 identify what parts of a vehicle are recyclable
  - 2.3 cite examples of initiatives that will increase the percentage of parts that can be recycled
  - 2.4 list ways government regulations have altered the design and construction of vehicles
  - 2.5 identify design features that are tied more closely to consumer taste than function
  - 2.6 identify and discuss the factors that have contributed to the use and development of new structural materials
  - 2.7 identify the factors used to select a material for a given function
  - 2.8 indicate how design and construction of a vehicle is affected by the medium (land, sea, air, space) in which it operates
  - 2.9 identify the monolith and composite materials used in a modern vehicle
- 3. examine and identify the basic parts and materials used in vehicle construction**
  - 3.1 describe the most appropriate methods of identifying the type of materials used in a part or structure
  - 3.2 describe the action of a coil spring when subject to rapid loading
  - 3.3 describe how to:
    - 3.3.1 reduce the weight of a vehicle
    - 3.3.2 reduce drag
    - 3.3.3 increase passenger safety
    - 3.3.4 increase longevity of structural parts
    - 3.3.5 improve passenger comfort and space
  - 3.4 demonstrate knowledge of common types of fasteners used including:
    - 3.4.1 studs, bolts, screws
    - 3.4.2 nuts
    - 3.4.3 rivets
    - 3.4.4 clips
    - 3.4.5 clamps

- 3.5 identify what structural coatings are used to:
  - 3.5.1 protect against corrosion
  - 3.5.2 add to the appearance
  - 3.5.3 reduce effects of the sun's radiation
  - 3.5.4 reduce noise
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. make personal connections to the cluster content and processes to inform possible pathway choices**
  - 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
  - 5.2 create a connection between a personal inventory and occupational choices



## **COURSE MEC1165: MECHANICS WELDING FUNDAMENTALS**

**Level:** Introductory

**Prerequisite:** MEC1015: Mechanics Tools & Materials

**Description:** Students perform metal heating and cutting operations safely using oxyacetylene equipment, and perform non-structural welding using Gas Metal Arc Welding (GMAW) equipment.

**Parameters:** Access to a materials work centre, complete with oxyacetylene heating and cutting equipment, GMAW equipment, fabrication facilities, and to instruction from an individual with formal specialized training in oxyacetylene and GMAW.

**Outcomes:** The student will:

### **Using Oxyacetylene Equipment:**

#### **1. identify and demonstrate the use of personal protective equipment**

- 1.1 use an appropriate fire extinguisher in the event of fire
- 1.2 use eye protection
- 1.3 use protective clothing
- 1.4 use protective footwear
- 1.5 use proper ventilation
- 1.6 follow proper safety procedures

#### **2. describe the characteristics and safe handling procedures for oxygen and acetylene**

- 2.1 identify and describe the properties of oxygen gas
- 2.2 identify and describe the make-up of an oxygen cylinder/bottle including valves and safety devices
- 2.3 identify and describe the properties of acetylene gas
- 2.4 identify and describe the make-up of an acetylene cylinder/bottle including valves and safety devices
- 2.5 correctly follow cylinder transport procedures
- 2.6 correctly mount cylinder and attach regulator and hoses

#### **3. demonstrate safe handling procedures for regulators and hoses**

- 3.1 identify and describe regulators and torches including:
  - 3.1.1 purpose
  - 3.1.2 regulator types
  - 3.1.3 torch types
  - 3.1.4 identification, hoses
  - 3.1.5 flashback arrestors
  - 3.1.6 torch check valves–reverse flow check valves
  - 3.1.7 torch types and parts

#### **4. demonstrate the safe use, care and maintenance of torches and tips**

- 4.1 identify and describe conditions that lead to backfires and flashbacks
- 4.2 identify and describe flame types and functions
- 4.3 demonstrate:
  - 4.3.1 purge and leak tests
  - 4.3.2 start-up and shut-down procedures

- 4.4 demonstrate:
  - 4.4.1 correct heating tip selection
  - 4.4.2 check and clean tips and torches
  - 4.4.3 install tips
  - 4.4.4 balance regulators and adjust torch flame
  - 4.4.5 heat metal
  - 4.4.6 shut down equipment

**5. perform basic cutting operations**

- 5.1 fit, light and adjust cutting torch
- 5.2 maintain cutting torch and tips
- 5.3 select correct tip for planned activity
- 5.4 cut holes in metal plate
- 5.5 cut and remove rivets and bolts
- 5.6 shut down cutting torch

**Using GMAW Welding Equipment:**

**6. identify and demonstrate the use of personal protective equipment**

- 6.1 identify the appropriate fire extinguisher in the event of a fire
- 6.2 use eye protection
- 6.3 use protective clothing
- 6.4 use protective footwear
- 6.5 use proper ventilation
- 6.6 follow proper safety procedures

**7. describe the principles of operation of GMAW**

- 7.1 identify and describe:
  - 7.1.1 principles of operation
  - 7.1.2 metal transfer

**8. identify the components of a basic GMAW set-up**

- 8.1 apply safe work practices and procedures to:
  - 8.1.1 select and use appropriate personal protective equipment
  - 8.1.2 maintain a clean and tidy work station
  - 8.1.3 demonstrate safe tool/material handling and storage techniques
- 8.2 for a given type of weld and/or weldment, select the appropriate:
  - 8.2.1 wire type, size and feed rate
  - 8.2.2 current
  - 8.2.3 shielding gas type and flow rate
- 8.3 prepare and clean all surfaces to be welded
- 8.4 properly position metal for welding
- 8.5 identify precautions to take against electric shock, toxic fumes and radiant energy associated with GMAW

**9. diagnose and demonstrate corrective measures for malfunctioning GMAW equipment**

- 9.1 describe and demonstrate the maintenance required for wire drive systems and gun assemblies

**10. demonstrate basic welding technique**

- 10.1 demonstrate tack weld components to gain competency
- 10.2 make light-gauge fillet welds in the flat and horizontal position and down-hand fillet welds on light gauge tubing

## **11. demonstrate basic competencies**

- 11.1 demonstrate fundamental skills to:
  - 11.1.1 communicate
  - 11.1.2 manage information
  - 11.1.3 use numbers
  - 11.1.4 think and solve problems
- 11.2 demonstrate personal management skills to:
  - 11.2.1 demonstrate positive attitudes and behaviours
  - 11.2.2 be responsible
  - 11.2.3 be adaptable
  - 11.2.4 learn continuously
  - 11.2.5 work safely
- 11.3 demonstrate teamwork skills to:
  - 11.3.1 work with others
  - 11.3.2 participate in projects and tasks

## **12. make personal connections to the cluster content and processes to inform possible pathway choices**

- 12.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 12.2 create a connection between a personal inventory and occupational choices



## **COURSE MEC1170: METAL FORMING & FINISHING**

**Level:** Introductory

**Prerequisite:** MEC1160: Structures & Materials

**Description:** Students repair and re-form damaged metal panels.

**Parameters:** Access to oxy-fuel welding equipment, basic autobody hand/power tools, basic metal refinishing material, resources and to instruction from an individual with formal specialized training.

**Supporting Course:** FAB1040: Oxyacetylene Welding

**Outcomes:** The student will:

- 1. demonstrate safe work practices when metal forming and finishing and follow established laboratory procedures**
  - 1.1 demonstrate safe practices in relation to:
    - 1.1.1 personal protective equipment/clothes
    - 1.1.2 use of impact tools, drills, grinders, cutters, sheet metal brake and shear
    - 1.1.3 safe use of oxyacetylene and Gas Metal Arc Welding (GMAW) equipment
    - 1.1.4 hazards of body fillers
- 2. describe the effects of physical damage caused by distortion and corrosion on sheet metal components**
  - 2.1 identify properties of:
    - 2.1.1 low carbon steels
    - 2.1.2 high strength steels
- 3. apply metal forming and finishing skills to repair minor panel damage**
  - 3.1 list tools and equipment available to shape and finish sheet metal
  - 3.2 identify the process required for specific types of metal shaping
  - 3.3 identify processes for metal working and repairing small dents using:
    - 3.3.1 pry bar
    - 3.3.2 pulling tools
    - 3.3.3 hammering techniques
  - 3.4 describe possible methods of small rust out repair
  - 3.5 describe the best method of small rust out repair
  - 3.6 identify various plastic filler materials available
  - 3.7 describe the suitable type of plastic fillers to be used
  - 3.8 complete a small rust out repair
  - 3.9 demonstrate how to:
    - 3.9.1 hammer and dolly metal panel to smooth contour
    - 3.9.2 pick, file and grind panel to desired finish
    - 3.9.3 prepare the surface for filler application
    - 3.9.4 apply plastic fillers and refinish



**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE MEC1190: SURFACE PREPARATION 1**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students assess the state of a painted surface and use appropriate restoration procedures.

**Parameters:** Access to painting facilities, surface preparation tools/materials and related resources.

**Outcomes:** The student will:

**1. demonstrate safe work practices for surface preparation and follow established laboratory procedures**

1.1 demonstrate safe practices in relation to:

1.1.1 abrasive dust

1.1.2 chemicals/fumes

**2. identify products, equipment and procedures associated with surface preparation**

2.1 identify and describe problem conditions in painted surfaces

2.2 list types of equipment/tools used in surface preparation processes

2.3 list types of abrasives used in surface preparation

2.4 identify alternative method of surface preparation; e.g., chemical stripping, blasting

2.5 demonstrate knowledge of types, purpose and methods of applying undercoats

2.6 identify types and uses of putties

2.7 identify methods of masking

2.8 list equipment used in masking

**3. prepare and perform a surface preparation**

3.1 explain and demonstrate methods of sanding

3.2 use appropriate methods of surface preparation

3.3 identify and apply appropriate metal conditioner

3.4 demonstrate how to mask a surface prior to painting

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

4.1.1 communicate

4.1.2 manage information

4.1.3 use numbers

4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

4.2.1 demonstrate positive attitudes and behaviours

4.2.2 be responsible

4.2.3 be adaptable

4.2.4 learn continuously

4.2.5 work safely

4.3 demonstrate teamwork skills to:

4.3.1 work with others

4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices

## **COURSE MEC1910: MEC PROJECT A**

**Level:** Introductory

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the introductory level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

### **Outcomes:**

The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. make personal connections to the cluster content and processes to inform possible pathway choices**

- 5.1 complete/update a personal inventory; e.g., interests, values, beliefs, resources, prior learning and experiences
- 5.2 create a connection between a personal inventory and occupational choices



## **COURSE MEC2010: VEHICLE DETAILING**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop the skills required to restore and enhance the exterior finishes of a vehicle.

**Parameters:** Access to commercially available products and related resources.

**Outcomes:** The student will:

- 1. state personal and environmental hazards associated with the use of cleaning and waxing agents**
  - 1.1 demonstrate knowledge of and follow safety rules and procedures in the handling of dangerous cleaning agents
  - 1.2 demonstrate safe handling and application of volatile cleaners used for engine cleaning
  - 1.3 demonstrate knowledge of and follow procedures outlined to prevent damage to electrical or other parts when engine cleaning
  - 1.4 identify hazards that are present; e.g., acid powder
- 2. identify and describe materials available to enhance the appearance of a vehicle**
  - 2.1 identify surface flaws and solutions that could be used other than spray painting
  - 2.2 explain the value of using waxes to treat painted surfaces; e.g., longevity, monetary implications
- 3. demonstrate the correct cleaning and treatment of engine parts and exterior finishes including paint, glass, vinyl and rubber surfaces**
  - 3.1 use materials available to complete an engine clean and, if possible, apply enhancing materials such as paints or coatings
  - 3.2 describe the value of maintaining a clean and neat engine compartment
  - 3.3 identify and demonstrate the correct procedures when using cleaning and polishing/treatment agents on various surfaces
  - 3.4 explain the value of using methods to enhance the appearance of a vehicle without painting
- 4. install a trim or accessory part according to standard practice**
  - 4.1 identify common types of trim fasteners and tools
  - 4.2 list the precautions needed to prevent damage to trim or adjacent surfaces when removing and replacing trim parts
  - 4.3 show knowledge of and demonstrate the procedures and tools used to remove and replace trim parts
  - 4.4 demonstrate the application of decals, pinstriping and/or moulding as a method of enhancing vehicle appearance and value
  - 4.5 demonstrate the ability to follow installation instructions by completing an accessory installation project
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2020: VEHICLE MAINTENANCE**

**Level:** Intermediate

**Prerequisite:** MEC1020: Vehicle Service & Care

**Description:** Students perform the basic service requirements necessary to ensure adequate maintenance of a motor vehicle.

**Parameters:** Access to vehicles, specialty tools, hand tools and related resources.

**Note:** Customer work is to be checked by a certified technician when work is performed on brakes, steering and suspension.

**Outcomes:** The student will:

- 1. demonstrate safe work practices when working with vehicles and follow established laboratory procedures**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
- 2. identify vehicle service requirements as per manufacturer's recommendations**
  - 2.1 identify the service requirements for a specific motor vehicle considering the odometer reading, conditions of operation and service history
- 3. conduct a motor vehicle inspection considering the age of the vehicle, distance travelled, service conditions and history**
  - 3.1 check tire condition
  - 3.2 mount and balance tires
  - 3.3 rotate tires to maximize wear life
  - 3.4 inspect steering and suspension system components
  - 3.5 inspect, repack and adjust wheel bearing
  - 3.6 lubricate steering and suspension system joints
  - 3.7 replenish fluids in power steering pump
  - 3.8 inspect and top-up brake fluid reservoir
  - 3.9 inspect and assess the wear characteristics of disc brake and drum brake components
  - 3.10 lubricate parking brake linkages
  - 3.11 inspect and service battery and battery clamps; renew clamps, if required
  - 3.12 adjust alternator belt tension, if necessary
  - 3.13 check the operation of all lights and replace bulbs, if required
  - 3.14 inspect fuse panel and renew inoperative fuses
  - 3.15 use a multimeter to test a charging system
  - 3.16 lubricate hinges on all opening panels and weatherstrips
  - 3.17 lubricate locks or lock plates, as required
  - 3.18 inspect and change windshield wiper blades, if necessary
  - 3.19 inspect for loose trim or mouldings
  - 3.20 identify and describe the condition of the camshaft timing belt or chain and recommend the appropriate service
  - 3.21 evaluate brake system fluid integrity and brake pedal feel and identify repair requirements

#### **4. service and repair a motor vehicle according to vehicle condition and service schedule**

- 4.1 demonstrate how to:
  - 4.1.1 inspect an engine for oil leaks
  - 4.1.2 renew engine gaskets or seals, where necessary
  - 4.1.3 change engine oil and filter
  - 4.1.4 service Positive Crankcase Ventilation (PCV) valve and breather
  - 4.1.5 inspect the condition of coolant, hoses, belts, fan and radiator; adjust belts, if required
  - 4.1.6 change or recondition the engine coolant and flush the cooling system, if required
  - 4.1.7 pressure test the cooling system
  - 4.1.8 replace the thermostat, if necessary
  - 4.1.9 locate and inspect the fuel filter; replace, if required
  - 4.1.10 replace the air filter, if required
  - 4.1.11 inspect and service throttle linkage
  - 4.1.12 inspect manifolds, pipes, catalytic converter, muffler and hangers for structural integrity; repair, as required
  - 4.1.13 inspect and service or replace spark plugs, distributor cap and rotor, and replace spark plug wires and boots, as required by the service schedule
  - 4.1.14 inspect and replace fuel purge canister filter, if required
  - 4.1.15 inspect and replace fluids, as required, in transmissions, transaxle transfer cases and differential assemblies
  - 4.1.16 inspect and recommend service for constant velocity joints, seals, drive shaft, drive axles and U-joints

#### **5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks

#### **6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MEC2030: LUBRICATION & COOLING**

**Level:** Intermediate

**Prerequisite:** MEC1040: Engine Fundamentals

**Description:** Students diagnose, maintain and service the lubrication and cooling systems of a typical four-cycle gasoline engine.

**Parameters:** Access to a pressure tester, hand tools and related resources.

**Outcomes:** The student will:

**1. demonstrate safe work practices when working with vehicle engine fluids**

- 1.1 identify the hazards associated with ethylene glycol
- 1.2 demonstrate knowledge of and follow all safety procedures associated with hot fluids and fluids under pressure
- 1.3 collect and dispose of all hazardous fluids in the appropriate manner
- 1.4 remove all spills from work area

**2. identify and describe functions and operations of engine cooling and lubrication system components**

- 2.1 identify the multiple tasks performed by the lubrication system
- 2.2 describe the properties of engine oils intended for use in a late model engine
- 2.3 interpret the meaning of the American Petroleum Institute (API) and Society of Automotive Engineers (SAE) symbols and viscosity numbers used on oil containers
- 2.4 describe the design and operation of:
  - 2.4.1 a gear and rotor-type oil pump
  - 2.4.2 a pressure regulator or relief valve
  - 2.4.3 an oil pressure sensor gauge or indicator
  - 2.4.4 an oil level and change indicator
- 2.5 identify possible causes of low/high oil pressure and high levels of oil consumption under normal operating conditions
- 2.6 explain the function of the cooling system
- 2.7 describe the relationship between the percentage of antifreeze and water to the coolant's freezing and boiling points
- 2.8 identify the most appropriate percentage of antifreeze to meet local conditions
- 2.9 describe the design and operation of a:
  - 2.9.1 radiator and cap
  - 2.9.2 fan
  - 2.9.3 thermostat
  - 2.9.4 hose
  - 2.9.5 water pump
  - 2.9.6 recovery tank
  - 2.9.7 block heater
- 2.10 identify possible causes for engine overheating or running cold under normal operating conditions



### **3. diagnose and correct lubrication and cooling system faults**

#### **3.1 demonstrate how to:**

- 3.1.1 inspect engine for oil leaks owing to gasket/seal failure
- 3.1.2 replace seal/gaskets, if necessary
- 3.1.3 disassemble and inspect a gear or rotor pump for pitting and galling or abnormal wear
- 3.1.4 test oil pressure sensor and gauge/light circuit; service, if necessary
- 3.1.5 test temperature sensing system; service, if necessary
- 3.1.6 inspect hoses for cracks, soft spots and leaks; replace, if necessary
- 3.1.7 test thermostat; replace, if necessary
- 3.1.8 inspect water pump for leaks and bearing condition
- 3.1.9 inspect radiator fan
- 3.1.10 inspect radiator for leaks and blockages; replace, if necessary
- 3.1.11 check condition and tension of fan belt; replace, if necessary

### **4. demonstrate basic competencies**

#### **4.1 demonstrate fundamental skills to:**

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

#### **4.2 demonstrate personal management skills to:**

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

#### **4.3 demonstrate teamwork skills to:**

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

### **5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2040: FUEL & EXHAUST SYSTEMS**

**Level:** Intermediate

**Prerequisite:** MEC1040: Engine Fundamentals

**Description:** Students diagnose, maintain and service the fuel and exhaust system of a typical four-cycle gasoline engine.

**Parameters:** Access to a ventilated area, a fuel pump vacuum/pressure tester and related resources, and to instruction from a certified technician when working on a customer vehicle.

**Outcomes:** The student will:

- 1. demonstrate safe work practices when working with volatile liquids and combustible gases**
  - 1.1 demonstrate knowledge of and follow all safety procedures associated with volatile liquids and exhaust gases
  - 1.2 demonstrate how to:
    - 1.2.1 store fuels and solvents in the appropriate manner
    - 1.2.2 maintain proper venting and air supply in the work area
- 2. identify and describe functions and operations of engine fuel and exhaust system components**
  - 2.1 describe the chemical composition of gasoline and the effects complete and incomplete combustion have on the environment and engine performance
  - 2.2 describe the characteristics of a quality gasoline in relation to its volatility and octane rating
  - 2.3 identify measures that are taken to:
    - 2.3.1 prevent the formation of gum deposits
    - 2.3.2 prevent the oxidation of metal parts
    - 2.3.3 retard icing
    - 2.3.4 aid in the identification of fuel types and grades
  - 2.4 describe the factors that affect combustion including:
    - 2.4.1 spark plug location
    - 2.4.2 combustion chamber size and shape
    - 2.4.3 compression ratio
    - 2.4.4 valve and combustion chamber design
    - 2.4.5 spark timing, duration and intensity
    - 2.4.6 air temperature and fuel ratio
    - 2.4.7 manifold pressures
    - 2.4.8 valve timing, valve lift and duration
  - 2.5 identify and describe the function of the major fuel system components
  - 2.6 explain the difference between a carburetor and a fuel injected system
  - 2.7 identify the common problems associated with carburetors and fuel injected systems
  - 2.8 locate and describe the function of the major exhaust system components

**3. diagnose and correct fuel and exhaust system faults**

- 3.1 inspect fuel filter/strainer and replace, if necessary
- 3.2 clean and adjust a typical carburetor on and off an engine
- 3.3 visually inspect and test a typical fuel injection system
- 3.4 test fuel pump pressure and capacity; repair or replace, if necessary
- 3.5 visually inspect and test for exhaust leaks or blockages; replace converters, pipes and mufflers, if necessary

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2050: ALTERNATIVE FUEL ENGINES**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students determine alternative fuels used to power motor vehicles.

**Parameters:** Access to related resources and basic hand tools.

**Outcomes:** The student will:

- 1. demonstrate safe work practices when working with alternative fuel vehicles**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 state how alternative fuels affect the environment
- 2. determine the type of fuel that is best suited to a particular use and type of vehicle**
  - 2.1 identify the typical alternative fuels; e.g., diesel, propane, methanol, natural gas, hydrogen
  - 2.2 compare the heat-producing characteristics of each fuel
  - 2.3 identify resources and methods of marketing different types of fuel
  - 2.4 identify ways in which fuels are stored
  - 2.5 describe the engine design modifications that are required to operate on:
    - 2.5.1 diesel
    - 2.5.2 propane
    - 2.5.3 methanol
    - 2.5.4 other
  - 2.6 describe the advantages of using an alternative fuel by considering:
    - 2.6.1 fuel cost
    - 2.6.2 availability
    - 2.6.3 performance
    - 2.6.4 engine life
    - 2.6.5 environmental impact
- 3. service an alternative fuel vehicle, recognizing its unique maintenance requirements**
  - 3.1 describe the specific service requirement for an alternative fuel engine
  - 3.2 complete a service and maintenance task according to the manufacturer's recommendations; e.g., change oil and fuel filters, engine lubricant, glow plugs and heaters
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MEC2060: IGNITION SYSTEMS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students identify the basic components and parts of ignition systems used on internal combustion engines, and service and repair an ignition system.

**Parameters:** Access to a multimeter, a timing light, hand tools and related resources.

**Supporting Courses:** MEC1040: Engine Fundamentals  
MEC1090: Electrical Fundamentals

**Outcomes:** The student will:

- 1. follow electrical safety guidelines by accurately interpreting and using instruction manuals**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 describe hazards involved when working with high voltages and currents
- 2. explain how a timed high voltage spark is achieved in magneto, point and electronic ignition systems**
  - 2.1 list and describe the three common types of ignition systems
  - 2.2 name the parts of the following ignition systems:
    - 2.2.1 magneto
    - 2.2.2 point type
    - 2.2.3 electronic
    - 2.2.4 computer-coil (distributorless)
- 3. recognize the drivability symptoms and use visual and instrument checks to diagnose ignition system faults**
  - 3.1 identify and describe symptoms produced by a typical ignition failure including:
    - 3.1.1 loose connection(s)
    - 3.1.2 faulty spark plug(s)
    - 3.1.3 faulty coil or wire
    - 3.1.4 bad distributor cap or rotor
    - 3.1.5 faulty points
    - 3.1.6 faulty pick-up coil
- 4. service and repair an ignition system**
  - 4.1 test the following:
    - 4.1.1 primary circuit voltage drop
    - 4.1.2 high tension lead resistance
    - 4.1.3 ignition coil
    - 4.1.4 ignition cap
    - 4.1.5 pick-up coil
    - 4.1.6 distributor points and condensor
    - 4.1.7 advance mechanisms
  - 4.2 show how to remove and analyze a spark plug to determine how well the engine is operating; e.g., oil consumption, fuel/air ratio and service/repair, if required
  - 4.3 lubricate distributor
  - 4.4 clean and tighten electrical leads and connections

- 4.5 complete the following according to the manufacturer's specifications:
  - 4.5.1 clean gap and/or replace with new spark plugs
  - 4.5.2 clean and/or replace with new contact points
  - 4.5.3 adjust contact points and pick-up coil gap
  - 4.5.4 adjust/repair advance mechanisms
  - 4.5.5 set ignition timing statically and check with a timing light
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2070: EMISSION CONTROLS**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students describe the importance of controlling emissions and the technology applied to vehicles to meet prescribed standards.

**Parameters:** Access to specialized equipment and resources related to analyzing and testing emission control.

**Supporting Courses:** MEC2030: Lubrication & Cooling  
MEC2040: Fuel & Exhaust Systems  
MEC2060: Ignition Systems

**Outcomes:** The student will:

- 1. demonstrate safe work practices when working with emission control systems**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 describe effect of vehicle emissions on the environment and specifically on human life
- 2. list and describe vehicle pollutants and their effects on the environment**
  - 2.1 list types and where vehicle pollutants are created
  - 2.2 explain how these pollutants are created
  - 2.3 identify regulations that dictate maximum pollutant levels
- 3. describe types and characteristics of pre- and post-combustion emission systems**
  - 3.1 identify and demonstrate knowledge of the operation of the following pre-combustion control systems:
    - 3.1.1 crankcase ventilation system
    - 3.1.2 exhaust gas recirculation system
    - 3.1.3 ignition spark control systems
    - 3.1.4 computerized engine controls
    - 3.1.5 evaporative control systems
    - 3.1.6 engine design modifications; i.e., combustion chamber, piston, cylinder head, manifold and air induction design
- 4. identify emission control components**
  - 4.1 identify and demonstrate knowledge of the operation of the following post-combustion control systems on several different types of vehicles:
    - 4.1.1 air injection system
    - 4.1.2 air aspirator system
    - 4.1.3 catalytic converters
- 5. diagnose and service emission control systems**
  - 5.1 demonstrate how to:
    - 5.1.1 check and service positive crankcase ventilation system
    - 5.1.2 check and service evaporative control system
    - 5.1.3 check and service air injector system
    - 5.1.4 check and service exhaust gas recirculation system
    - 5.1.5 check catalytic converter
    - 5.1.6 check and adjust spark control system

5.1.7 check computerized engine controls

5.1.8 using exhaust gas analyzer, if available, check emissions for a given vehicle

**6. demonstrate basic competencies**

6.1 demonstrate fundamental skills to:

6.1.1 communicate

6.1.2 manage information

6.1.3 use numbers

6.1.4 think and solve problems

6.2 demonstrate personal management skills to:

6.2.1 demonstrate positive attitudes and behaviours

6.2.2 be responsible

6.2.3 be adaptable

6.2.4 learn continuously

6.2.5 work safely

6.3 demonstrate teamwork skills to:

6.3.1 work with others

6.3.2 participate in projects and tasks

**7. identify possible life roles related to the skills and content of this cluster**

7.1 recognize and then analyze the opportunities and barriers in the immediate environment

7.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2090: ELECTRICAL COMPONENTS**

**Level:** Intermediate

**Prerequisite:** MEC1090: Electrical Fundamentals

**Description:** Students identify and describe the basic use and testing of the electrical components of a typical motor vehicle.

**Parameters:** Access to a voltmeter, ohmmeter, ammeter, alternator, starter and related resources.

**Outcomes:** The student will:

**1. demonstrate safe work practices when working with electrical components**

- 1.1 demonstrate knowledge of and follow laboratory safety procedures with respect to electrical hazards, including:
  - 1.1.1 electrical shocks
  - 1.1.2 electrical burns
- 1.2 demonstrate how to avoid sparks and grounding
- 1.3 explain electrical polarity

**2. describe the function and operation of a vehicle's electrical systems and components**

- 2.1 locate the major electrical/electronic systems in a motor vehicle; e.g., lighting, charging, starting
- 2.2 explain the operation and function of each of the electrical/electronic systems
- 2.3 show how electrical/electronic systems interact with other vehicle systems; e.g., suspension and braking systems
- 2.4 identify and explain the purpose and basic component parts of charging, starting and lighting systems
- 2.5 identify and draw the symbols for common electrical components
- 2.6 identify and describe the ratings that are given to electrical components; e.g., resistance, voltage, amperage and power rating

**3. identify electrical faults, by using standard diagnostic and testing procedures**

- 3.1 identify and describe the purpose and functions of a:
  - 3.1.1 voltmeter
  - 3.1.2 ohmmeter
  - 3.1.3 ammeter
  - 3.1.4 multimeter
  - 3.1.5 load tester
  - 3.1.6 tack dwell meter
  - 3.1.7 growler
- 3.2 calibrate correctly, connect accurately and read the appropriate test equipment to determine:
  - 3.2.1 open and closed circuit
  - 3.2.2 load voltage and drop
  - 3.2.3 current draw
  - 3.2.4 component resistance

**4. test and service electrical components**

- 4.1 identify and correct faults associated with electrical components and instruments
- 4.2 overhaul a starter motor assembly
- 4.3 overhaul an alternator



**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2100: POWER ASSIST ACCESSORIES**

**Level:** Intermediate

**Prerequisite:** MEC1110: Pneumatics & Hydraulics

**Description:** Students identify and explain the function of components and parts of power assist accessories.

**Parameters:** Access to a multimeter, power assist accessories and related resources.

**Note:** Customer work must be checked by certified technician.

**Supporting Course:** MEC1090: Electrical Fundamentals

**Outcomes:** The student will:

- 1. demonstrate safe work practices when working on power assist accessories**
  - 1.1 demonstrate established laboratory safety procedures
  - 1.2 demonstrate practices that prevent damage to components
- 2. list components and state functions of power assist accessories**
  - 2.1 describe the types and basic functions of power assist accessories found on vehicles
  - 2.2 compare power assist accessories to the mechanical systems they have replaced
  - 2.3 evaluate current power assist accessories as a means of forecasting types of power assist accessories that may be used in future vehicles
- 3. describe and check major components, of power assist accessories**
  - 3.1 list the parts of selected power assist accessories
  - 3.2 describe the function of the major parts of selected power assist accessories
  - 3.3 trace the power path of selected power assist accessories
- 4. service and repair power assist accessories**
  - 4.1 demonstrate how to use shop manuals to diagnose power assist accessory faults specific to power assist accessories
  - 4.2 identify problems and faults in power assist accessories systems
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2110: BRAKING SYSTEMS**

**Level:** Intermediate

**Prerequisite:** MEC1110: Pneumatics & Hydraulics

**Description:** Students develop the necessary knowledge, skills and attitudes to diagnose, service and maintain a braking system according to accepted trade practices.

**Parameters:** Access to specialized brake tools and related resources.

**Note:** Customer work must be supervised by certified technician.

**Outcomes:** The student will:

**1. demonstrate safe work practices when working on brakes**

- 1.1 demonstrate knowledge of and follow laboratory safety procedures
- 1.2 demonstrate proper disposal of brake dust

**2. identify brake design and components, and parking brake systems**

- 2.1 identify the parts of a hydraulic brake drum system
- 2.2 compare the operating principles of duo-servo and non-servo brake systems
- 2.3 identify the parts of a disc brake system
- 2.4 compare the operating principles of fixed, floating and sliding calliper braking systems
- 2.5 describe the operation of a combined disc and drum system
- 2.6 identify the parts of a parking brake system
- 2.7 compare the operating principles of a parking brake system on disc and drum brake applications

**3. inspect and analyze disc and drum brake systems**

- 3.1 demonstrate how to:
  - 3.1.1 prepare a work order, using appropriate questioning to determine brake problems
  - 3.1.2 check the master cylinder fluid level
  - 3.1.3 inspect drum and disc brake linings for wear
  - 3.1.4 inspect drum and rotor for service
  - 3.1.5 inspect drum brake backing plate for service
  - 3.1.6 inspect drum brake spring and hardware for service
  - 3.1.7 adjust a parking brake cable

**4. interpret parts and service manuals to perform routine brake system service and maintenance**

- 4.1 demonstrate how to:
  - 4.1.1 machine a brake drum and rotor according to the manufacturer's specifications
  - 4.1.2 remove and replace disc and drum brake shoes
  - 4.1.3 remove/replace and overhaul a master cylinder, wheel cylinder and calliper
  - 4.1.4 replace a flexible brake hose
  - 4.1.5 bleed and flush a brake system
  - 4.1.6 replace a parking brake cable

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MEC2120: HYDRAULIC ACCESSORIES**

**Level:** Intermediate

**Prerequisite:** MEC1110: Pneumatics & Hydraulics

**Description:** Students develop a basic knowledge of hydraulic components, applications and servicing techniques.

**Parameters:** Access to basic hand tools, hydraulic systems and related resources.

**Outcomes** The student will:

- 1. demonstrate safe work practices when working with hydraulic systems**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 explain hazards associated with pressure and heat build-up hydraulic systems
- 2. describe the functions of hydraulic components in a hydraulic system**
  - 2.1 describe the properties of hydraulic fluids in relation to:
    - 2.1.1 viscosity
    - 2.1.2 lubricating ability
    - 2.1.3 resistance to oxidation
    - 2.1.4 corrosion prevention
  - 2.2 identify the common types of connecting lines/hoses, fitting and seals
  - 2.3 describe the internal parts of a reservoir and state the purpose of filters, strainers and breathers
  - 2.4 describe the construction and operation of:
    - 2.4.1 cylinders
    - 2.4.2 gear and vane motors
  - 2.5 describe the function of:
    - 2.5.1 check and pressure control valves
    - 2.5.2 two- and four-way valves
  - 2.6 describe the construction and operation of gear, vane and piston pumps
  - 2.7 explain why and when accumulators are used in a hydraulic system
- 3. interpret parts and service manuals to provide appropriate maintenance and service procedures on a hydraulic system**
  - 3.1 identify and describe appropriate maintenance and service procedures on a hydraulic system
- 4. service hydraulic components**
  - 4.1 demonstrate how to:
    - 4.1.1 check fluid levels in reservoirs
    - 4.1.2 clean strainers
    - 4.1.3 replace system filters with the approved parts
    - 4.1.4 check seals for leaks and replace, if required
    - 4.1.5 replace a defective hose, line and fitting
    - 4.1.6 replace the hydraulic fluid in a system
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2130: DRIVE LINE**

**Level:** Intermediate

**Prerequisite:** MEC1130: Mechanical Systems

**Description:** Students identify the purpose, describe the operation and perform the servicing of a vehicle drive line.

**Parameters:** Access to drive line units, hand tools, specialized drive line tools and related resources.

**Outcomes:** The student will:

- 1. demonstrate safe work practices when working with vehicle drive lines**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 identify potential back problems associated with lifting heavy objects
- 2. identify the purpose and describe the function of the major drive line components**
  - 2.1 list and describe the function of component assemblies in a drive line
  - 2.2 identify the construction, design features, operation and function of common drive line components
  - 2.3 differentiate between the following:
    - 2.3.1 slip yokes
    - 2.3.2 fixed yokes
    - 2.3.3 conventional universal joints including:
      - 2.3.3.1 constant velocity (CV) joints
      - 2.3.3.2 drive shaft
- 3. execute inspection, diagnostic, service and repair procedures on specific drive line components**
  - 3.1 inspect drive line components including:
    - 3.1.1 joints
    - 3.1.2 straps
    - 3.1.3 boots
    - 3.1.4 drive shafts/half shafts
    - 3.1.5 centre support bearings
    - 3.1.6 yokes
  - 3.2 repair the coupling joint or shaft, as required, to return it to serviceability according to manufacturer's specifications
  - 3.3 inspect the drive line components for alignment, wear and looseness
  - 3.4 identify the cause of noise or vibration and repair or recommend required repair
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2140: TRANSMISSIONS/TRANSAXLES**

**Level:** Intermediate

**Prerequisite:** MEC2130: Drive Line

**Description:** Students perform inspection service and repair procedures on manual transmissions, transaxles and clutch assemblies.

**Parameters:** Access to pilot shafts, specialized manual transmission tools, presses, pullers and related resources, and clutch, transmission and transaxle units.

**Outcomes:** The student will:

- 1. demonstrate safe work practices when working on transmissions and transaxles**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 identify back problems associated with lifting heavy objects
- 2. identify parts and trace power flow through a clutch, manual transmission and differential and manual transaxle assembly**
  - 2.1 describe the operation of a clutch assembly, a manual transmission and a manual transaxle during various modes of vehicle operation
  - 2.2 describe the relationship that the clutch and manual gear box have to other parts of the drive line
  - 2.3 identify the parts of the assemblies, using the proper technical terms
  - 2.4 for each gear, identify the path of power through transmission or transaxle and compare the gear ratio of each power routing, as well as the direction of rotation
- 3. inspect, diagnose, service and repair clutch, manual transmission or manual transaxle assemblies**
  - 3.1 demonstrate how to:
    - 3.1.1 check clutch pedal operation, travel and free play adjustment
    - 3.1.2 remove clutch inspection cover and check for wear to the clutch disc and pressure plate, as well as other visually available parts
    - 3.1.3 inspect clutch linkage for faults and/or wear
    - 3.1.4 inspect shifting linkages for any undue looseness or signs of wear
    - 3.1.5 check lubricant for level and type and recommended change interval
    - 3.1.6 inspect mounts, braces and isolator cushions for wear fatigue or damage
    - 3.1.7 inspect the assembly for leakage and note location and seal at fault
    - 3.1.8 prepare a repair cost estimate, prior to commencement of repairs, as identified during inspection or servicing
  - 3.2 formulate probable causes for typical problems that develop with clutches including:
    - 3.2.1 grabbing
    - 3.2.2 slipping
    - 3.2.3 failing to release
    - 3.2.4 noise when disengaged
    - 3.2.5 noise when engaging
  - 3.3 where possible, relate the hypothetical situation to a real vehicle condition
  - 3.4 formulate probable causes for typical problems that develop with manual gear boxes including:
    - 3.4.1 gears clashing
    - 3.4.2 hard shifting
    - 3.4.3 jumping out of gear



- 3.4.4 noises in specific gears
- 3.4.5 inability to engage gears
- 3.4.6 shifter noisy or loose
- 3.4.7 bearing noises

3.5 perform the clutch repairs, as identified and estimated to the teacher and agreed upon by the owner of the vehicle

AND/OR

- 3.6 remove and reinstall a clutch disc, pressure plate assembly, pilot bearing and throw-out bearing; check each part to confirm the continued serviceability of the assembly and clean each part before reassembly; adjust linkage to specified clearances
- 3.7 adjust clutch linkage for correct free play at pedal or, in the case of an automatic clutch adjuster, confirm the operation as being correct
- 3.8 follow through on agreed-upon transmission/transaxle repairs, identified and estimated to the teacher and the owner of the vehicle

AND/OR

- 3.9 disassemble, inspect and reassemble a three- or four-speed manual transmission with external linkage and constant mesh gearing
- 3.10 replace manual transmission lubricant with the specified type

#### **4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

#### **5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2150: SUSPENSION SYSTEMS**

**Level:** Intermediate

**Prerequisite:** MEC1150: Ride & Control Systems

**Description:** Students develop the knowledge, skills and attitudes necessary to service and maintain vehicle suspension systems.

**Parameters:** Access to suspension systems, specialized suspension tools and related resources.

**Note:** Customer work must be checked by certified technician.

**Outcomes:** The student will:

**1. demonstrate safe work practices when working on suspension systems**

- 1.1 demonstrate knowledge of and follow laboratory safety procedures when working on suspension components

**2. identify the purpose and function of suspension parts**

- 2.1 describe the basic types of front and rear suspensions used on motor vehicles; e.g., short, long arm suspension and MacPherson strut
- 2.2 compare the advantages and disadvantages of using separate and integral frames in relation to suspension design, repair and servicing
- 2.3 explain the advantage of using a:
  - 2.3.1 solid “I” beam
  - 2.3.2 split “I” beam
  - 2.3.3 independent front suspension and a:
    - 2.3.3.1 rigid suspension
    - 2.3.3.2 independent rear suspension
- 2.4 explain why it is important to reduce the amount of unsprung weight
- 2.5 list the positive and negative features of using coil, leaf, torsion, rubber biscuit and air springs
- 2.6 explain the meaning of spring rate and travel
- 2.7 list basic types and describe the operation of shock absorbers, mounting techniques and methods of testing

**3. identify worn or defective suspension parts**

- 3.1 describe typical wheel bearing faults; e.g., bent cage, etching, overheating, worn seal
- 3.2 repack a front or rear wheel bearing
- 3.3 lubricate suspension joints, where necessary
- 3.4 inspect suspension components for damage and wear
- 3.5 explain how ball joints are checked for wear

**4. service a suspension system**

- 4.1 remove and replace a:
  - 4.1.1 shock absorber
  - 4.1.2 coil spring
  - 4.1.3 ball joint
  - 4.1.4 strut
- 4.2 identify the appropriate lifting and towing procedures relative to electronically controlled suspension systems

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

- 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2160: STEERING SYSTEMS**

**Level:** Intermediate

**Prerequisite:** MEC1150: Ride & Control Systems

**Description:** Students develop the knowledge, skills and attitudes necessary to maintain a steering system.

**Parameters:** Access to steering systems, specialized steering tools and related resources.

**Note:** Customer work must be checked by certified technician.

**Outcomes:** The student will:

**1. demonstrate safe work practices when working on steering systems**

- 1.1 demonstrate knowledge of and follow laboratory safety procedures when working on steering systems, and explain the importance of proper adjustments and torques

**2. identify different steering system designs and applications**

- 2.1 identify common types of steering gears used to create the necessary mechanical advantages to overcome tire resistance; e.g., recirculating ball, rack and pinion
- 2.2 identify and compare the operation of two or more steering boxes
- 2.3 identify and compare the operation of common types of power steering pumps; e.g., roller, vane, slipper, gear

**3. diagnose problems related to manual and power steering systems**

- 3.1 demonstrate how to:
  - 3.1.1 overhaul and adjust a recirculating ball and rack and pinion steering gear
  - 3.1.2 diagnose power steering problems including:
    - 3.1.2.1 pressure testing
    - 3.1.2.2 flow testing
    - 3.1.2.3 electrical tests

**4. service/repair a vehicle steering system**

- 4.1 clean and inspect steering linkage for wear and replace, if necessary
- 4.2 inspect steering joints, bushings and replace, if necessary
- 4.3 inspect and service power steering components

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems
- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely

5.3 demonstrate teamwork skills to:

5.3.1 work with others

5.3.2 participate in projects and tasks

**6. identify possible life roles related to the skills and content of this cluster**

6.1 recognize and then analyze the opportunities and barriers in the immediate environment

6.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MEC2170: METAL REPAIR & FINISHING**

**Level:** Intermediate

**Prerequisite:** MEC1170: Metal Forming & Finishing

**Description:** Students analyze and repair metal damage.

**Parameters:** Access to Gas Metal Arc Welding (GMAW) and Oxyacetylene Welding (OAW) welders, basic auto body hand/power tools and related resources.

**Outcomes:** The student will:

**1. demonstrate safe work practices when metal forming and finishing metal damage**

1.1 demonstrate safe practices in relation to the:

- 1.1.1 use of welding equipment
- 1.1.2 use of solder and soldering equipment
- 1.1.3 sheet metal straightening system

**2. identify different damage conditions and repair procedures for metal damage**

2.1 identify and describe the type/extent of minor sheet metal damage

2.2 list sequence of repair

2.3 identify and describe major sheet metal impact damage conditions including:

- 2.3.1 direct
- 2.3.2 indirect

2.4 list sequence of repair

**3. repair metal damage to a vehicle**

3.1 demonstrate how to:

- 3.1.1 perform metal straightening
- 3.1.2 perform metal replacement work
- 3.1.3 repair damaged aluminum panel
- 3.1.4 repair a panel using body solder
- 3.1.5 complete a large rust out repair

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

5.1 recognize and then analyze the opportunities and barriers in the immediate environment

5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MEC2180: TRIM REPLACEMENT**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students demonstrate the removal and repair of trim parts, with an emphasis on removal and installation without damage.

**Parameters:** Access to specialized trim tools and related resources.

**Supporting Course:** MEC1190: Surface Preparation 1

**Outcomes:** The student will:

- 1. demonstrate the safe use of tools and chemicals for trim replacement**
  - 1.1 identify hazards when working with trim
- 2. investigate interior and exterior trim systems used to enhance appearances**
  - 2.1 identify the materials used for interior trim and the fastening system for each, and describe the correct method of removal
  - 2.2 describe the methods to remove and install interior trim
  - 2.3 describe precautions to be adhered to when removing and installing trim
  - 2.4 describe methods used to attach trim accessories, door locks, mirrors, etc.
  - 2.5 explain how to remove and replace specified trim
  - 2.6 identify fasteners specific to exterior trim, including clips and adhesives
  - 2.7 explain the inherent value of decals, vinyl and overlays
  - 2.8 describe procedures for the removal of decals, vinyl and overlays
  - 2.9 describe the function of weather stripping
  - 2.10 identify two or three different methods of weather stripping and explain the significance of the differences
  - 2.11 identify two or three procedures needed to remove accessories and implications for repair or replacement
- 3. remove and install trim and weather stripping**
  - 3.1 demonstrate correct procedures and use of tools used in the removal of mouldings, emblems and accessories
  - 3.2 install selected exterior trim
  - 3.3 successfully remove and install a door seal, test seal and adjust hardware accordingly
- 4. analyze and install enhancement trim e.g., locks, mirrors, lights**
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. identify possible life roles related to the skills and content of this cluster**
  - 6.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 6.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2190: SURFACE PREPARATION 2**

**Level:** Intermediate

**Prerequisite:** MEC1190: Surface Preparation 1

**Description:** Students perform advanced surface preparations.

**Parameters:** Access to auto body hand/power tools and related resources.

**Outcomes:** The student will:

- 1. demonstrate safe practices when performing advanced surface preparations**
  - 1.1 demonstrate safe practices in relation to chemicals
- 2. explain materials and practices for performing advanced surface preparations**
  - 2.1 identify specific metal treatments including:
    - 2.1.1 aluminum
    - 2.1.2 plymetal
    - 2.1.3 galvanized
    - 2.1.4 other
  - 2.2 identify equipment, materials and accepted procedures in compounding surfaces
  - 2.3 match adhesion promoters to the type of plastic being finished
  - 2.4 use correct cleaning agent to match plastics and product used
  - 2.5 identify and describe custom masking methods
- 3. carry out an advanced surface preparation**
  - 3.1 demonstrate how to:
    - 3.1.1 prepare bare metal
    - 3.1.2 clean and treat surface rust as conditions dictate
    - 3.1.3 compound surfaces
    - 3.1.4 prime plastic and metal components
    - 3.1.5 custom mask a small project
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities





## **COURSE MEC2200: REFINISHING 1**

**Level:** Intermediate

**Prerequisite:** MEC2190: Surface Preparation 2

**Description:** Students demonstrate metal surface refinishing procedures.

**Parameters:** Access to spray equipment and related resources.

**Outcomes:** The student will:

- 1. demonstrate safe practices and follow all warnings identified by product manufacturers, Workplace Hazardous Materials Information System (WHMIS), and Occupational Health and Safety**
  - 1.1 demonstrate knowledge of health hazards and environmental impacts of products used
  - 1.2 demonstrate use of personal protective equipment, as recommended by manufacturer
- 2. identify and describe refinishing products and equipment**
  - 2.1 identify types of topcoats, solvents and additives
  - 2.2 identify and select colour and type of paint on a given vehicle
  - 2.3 demonstrate knowledge of proper procedure in paint preparation
  - 2.4 inspect pre-paint project and determine deficiencies
  - 2.5 identify basic spray gun types
  - 2.6 show how to troubleshoot spray gun
  - 2.7 demonstrate knowledge of refinishing equipment accessories
  - 2.8 demonstrate knowledge of proper topcoat application techniques
  - 2.9 show how to troubleshoot basic application problems
- 3. demonstrate proper refinishing application**
  - 3.1 prepare booth for spraying
  - 3.2 prepare and apply topcoat
  - 3.3 demonstrate knowledge of and perform the cleaning of spray guns
  - 3.4 perform final detailing by:
    - 3.4.1 removing masking tape
    - 3.4.2 checking and correcting surface defects
    - 3.4.3 completing the final cleaning and inspection
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely

- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC2210: TOUCH-UP & FINISHING**

**Level:** Intermediate

**Prerequisite:** MEC2200: Refinishing 1

**Description:** Students determine and use the appropriate materials, tools and processes for minor surface repairs.

**Parameters:** Access to spray equipment and related resources.

**Supporting Course:** MEC1160: Structures & Materials

**Outcomes:** The student will:

- 1. practice safe handling, use and disposal of hazardous touch-up and finishing products**
  - 1.1 demonstrate knowledge of the safety precautions required for:
    - 1.1.1 feather edging with dual action orbital sanders
    - 1.1.2 handling of primer products and putties
    - 1.1.3 spraying primers
- 2. identify the techniques and products required to complete a minor surface repair**
  - 2.1 identify the imperfections in paint or freshly prepared surfaces; e.g., sand scratches, runs, dry spray, orange peel, bull's eye, sags, chips
  - 2.2 demonstrate the spot repair concepts, as required by industry, including colour matching concepts of two types of paint including:
    - 2.2.1 solids
    - 2.2.2 metallics
  - 2.3 describe the advantages of the base/clear system of paint in colour matching
- 3. demonstrate the skills required to prepare and refinish a spot repair**
  - 3.1 perform a surface flaw repair of a painted panel, using sandpaper and compounds without repainting
  - 3.2 prepare a panel for a spot repair and follow appropriate instructions in the application of primer and paint
  - 3.3 show proper procedures in the application and sanding of putties
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities



## **COURSE MEC2220: INTERIOR REPAIRS**

**Level:** Intermediate

**Prerequisite:** MEC1160: Structures & Materials

**Description:** Students search for and use the appropriate products and techniques to maintain vehicle interior surface materials.

**Parameters:** Access to interior materials, products, tools, equipment and related resources.

**Outcomes:** The student will:

- 1. practice safe handling, use and disposal of hazardous cleaning and repair products**
  - 1.1 demonstrate knowledge of and follow safety rules and procedures for the products used for interior care
  - 1.2 identify hazards associated with the improper use of certain volatile chemicals
- 2. analyze type of repair or restoration required, and identify the techniques/products necessary to repair and/or restore an interior surface**
  - 2.1 identify cleaners for the following materials:
    - 2.1.1 leather
    - 2.1.2 cloth
    - 2.1.3 vinyl
    - 2.1.4 rubber
    - 2.1.5 plastic
    - 2.1.6 polyurethane foam
  - 2.2 describe the correct procedures and products that can safely be used for cleaning and maintenance; e.g., volatile cleaners, neutral soaps, specialty products
  - 2.3 compile an identification of interior parts and clean the parts to “like-new” condition or “best as can be expected,” depending on the condition; include glass in the cleaning
  - 2.4 identify and describe the nature of stains; e.g., soil, grease, oil, tar, blood, wax, chocolate, non-chocolate candy
  - 2.5 identify correct procedures for the removal of three of the above
  - 2.6 compile a chart showing the stain removal procedures, including special products, if required
- 3. clean and/or repair an interior surface**
  - 3.1 replace the vinyl or cloth covering on a door rest
  - 3.2 complete a vinyl or plastic repair of a crack or hole in an interior part and refinish
  - 3.3 successfully remove and replace weather stripping in either a door glass area or door opening
  - 3.4 identify signs of poor sealing by weather stripping and adjust, if possible
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. identify possible life roles related to the skills and content of this cluster**
  - 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
  - 5.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE MEC2910: MEC PROJECT B**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:** The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

**COURSE MEC2920: MEC PROJECT C**

**Level:** Intermediate

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:** The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. identify possible life roles related to the skills and content of this cluster**

- 5.1 recognize and then analyze the opportunities and barriers in the immediate environment
- 5.2 identify potential resources to minimize barriers and maximize opportunities

## **COURSE MEC3010: BUYING & SELLING VEHICLES**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop the skills required to make an informed purchase or sale of a vehicle.

**Parameters:** Access to new and used vehicle reports and other related resources.

**Outcomes:** The student will:

**1. investigate and determine the type of vehicle that best meets a defined need**

- 1.1 identify safety concerns when dealing with unfamiliar vehicles
- 1.2 identify the factors that affect the choice of a vehicle including:
  - 1.2.1 intended use and length of service
  - 1.2.2 required performance and economy
  - 1.2.3 funds or financing available
  - 1.2.4 emotional appeal
  - 1.2.5 consumer reports

**2. evaluate and describe the condition of a vehicle**

- 2.1 identify the parts of a vehicle that can be inspected by:
  - 2.1.1 visual means
  - 2.1.2 road testing
  - 2.1.3 instrument checks
- 2.2 calculate the value of a vehicle by:
  - 2.2.1 having it appraised by more than one experienced individual
  - 2.2.2 comparing the appraisal to published prices
  - 2.2.3 calculating the value through depreciation
  - 2.2.4 comparing with the asking price of similar vehicles

**3. plan a strategy to sell or buy a vehicle**

- 3.1 describe the advantages and disadvantages of purchasing a vehicle:
  - 3.1.1 privately
  - 3.1.2 by auction
  - 3.1.3 through dealers
  - 3.1.4 through lease agencies
  - 3.1.5 through rental agencies
  - 3.1.6 through government agencies
- 3.2 select or recommend a seller based on:
  - 3.2.1 the seller's reputation
  - 3.2.2 ability to service
  - 3.2.3 willingness to back the product
  - 3.2.4 number of vehicles to choose from
- 3.3 describe the advantages of selling a vehicle:
  - 3.3.1 on consignment
  - 3.3.2 privately
  - 3.3.3 on a trade

- 3.4 clean and restore the appearance of the vehicle to “next-to-new” standards
- 3.5 organize and prepare a record of the vehicle’s service and maintenance record
- 4. recognize the legal rights and responsibilities of both the seller and purchaser**
  - 4.1 identify legal steps when buying and selling a vehicle
  - 4.2 prepare an offer to purchase including:
    - 4.2.1 condition and age of the vehicle
    - 4.2.2 dealer cost
    - 4.2.3 profit level
    - 4.2.4 value of trade-in
    - 4.2.5 cost of financing
    - 4.2.6 ability to pay or make payment
    - 4.2.7 possible liens
- 5. identify safety concerns and regulations when buying and selling vehicles that have been repaired after an accident**
  - 5.1 research and identify safety concerns when:
    - 5.1.1 buying a vehicle
    - 5.1.2 selling a vehicle that has had extensive repairs due to an accident
  - 5.2 research and identify Internet sites providing vehicle information; e.g., vehicle information report from Alberta Transportation
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE MEC3020: VEHICLE VALUE APPRAISAL**

**Level:** Advanced

**Prerequisite:** MEC2020: Vehicle Maintenance

**Description:** Students demonstrate the procedures used by the vehicle repair industry to estimate the cost of a repair and the market value of a vehicle.

**Parameters:** Access to new and used vehicle reports and other related resources.

**Outcomes:** The student will:

- 1. demonstrate established safety and care procedures when inspecting vehicles**
  - 1.1 demonstrate knowledge of and follow predetermined shop guidelines when working on or around vehicles
- 2. inspect a vehicle to determine its overall condition and repair requirements**
  - 2.1 investigate and report on the condition of a vehicle using a comprehensive method, including owner interview and inspection report completion
  - 2.2 examine and report on the system(s) that require repair to determine the extent of reconditioning required to return the system(s) to serviceability
  - 2.3 construct a basis for vehicle valuation by determining the vehicle characteristics that would contribute to market value; e.g., year, make, model, options, mileage, relative condition, emotional appeal, popularity
  - 2.4 complete an evaluation checklist
  - 2.5 list probable and possible parts required to effect a complete repair using original equipment, aftermarket and used parts
  - 2.6 use accepted industry labour guides to calculate the correct labour charges for the required parts replacements, considering all modifications or options to the subject vehicle
- 3. apply standards used by the vehicle repair industry to appraise the condition and value of a vehicle**
  - 3.1 identify the wholesale value of a subject vehicle using the accepted wholesale reference guides
  - 3.2 calculate the market value of a subject vehicle by comparative pricing on three similar vehicles in the local marketplace
  - 3.3 identify the wholesale value of a subject vehicle using the accepted wholesale reference guides
  - 3.4 calculate the market value of a subject vehicle by comparative pricing on three similar vehicles in the local marketplace
- 4. outline the best business practices to follow when situations of uncertainty or conflicting interests occur relative to an appraisal**
  - 4.1 describe business practices when resolving conflicts related to estimations and evaluations
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE MEC3030: ENGINE DIAGNOSIS**

**Level:** Advanced

**Prerequisite:** MEC1040: Engine Fundamentals

**Description:** Students learn to diagnose the condition of an engine for worn or damaged parts and/or improper adjustments.

**Parameters:** Access to a vehicle engine, diagnostic test equipment and related resources.

**Supporting Courses:** MEC2030: Lubrication & Cooling  
MEC2040: Fuel & Exhaust Systems  
MEC2060: Ignition Systems  
MEC2070: Emission Controls

**Outcomes:** The student will:

- 1. demonstrate safe working practices while conducting an engine performance diagnosis**
  - 1.1 demonstrate safety while diagnosing engines
- 2. diagnose the condition of an operating engine, using body senses; e.g., touch, sight, hearing**
  - 2.1 list possible engine problems based on information provided
  - 2.2 describe through listening, observing and touching a running and/or stopped engine whether abnormalities exist
  - 2.3 identify engine type and manufacturer's specifications
- 3. assess engine conditions, using specialized test equipment and on-board diagnostic systems**
  - 3.1 demonstrate how to:
    - 3.1.1 analyze intake manifold vacuum
    - 3.1.2 check ignition timing and advance mechanisms
    - 3.1.3 check for proper idle speeds
    - 3.1.4 check engine oil pressure
    - 3.1.5 check cylinder compression readings
    - 3.1.6 check exhaust emissions
  - 3.2 identify any abnormalities on the vehicle using gauges and lights, including self-diagnostics
  - 3.3 use an engine analyzer and/or computerized tester to describe the condition of various engine systems as per capability of the test unit
- 4. provide a report that describes the condition of an engine**
  - 4.1 compile all information and generate a report for the customer outlining defects found and recommended corrections
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE MEC3040: ENGINE TUNE-UP**

**Level:** Advanced

**Prerequisite:** MEC3030: Engine Diagnosis

**Description:** Students diagnose, service and repair engine, fuel, ignition, charging and starting systems.

**Parameters:** Access to engine diagnostic equipment and supporting resources.

**Supporting Courses:** MEC2030: Lubrication & Cooling  
MEC2040: Fuel & Exhaust Systems  
MEC2060: Ignition Systems  
MEC2070: Emission Controls  
MEC2090: Electrical Components  
MEC3030: Engine Diagnosis

**Outcomes:** The student will:

- 1. demonstrate safe work practices while performing an engine tune-up**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
- 2. determine the mechanical condition of an engine**
  - 1.2 demonstrate how to:
    - 2.1.1 perform a static and dynamic compression test to determine the mechanical condition of an engine
    - 2.1.2 do a leakdown test
  - 2.2 record and analyze results
- 3. check and service a carburetor and a fuel injection system**
  - 3.1 identify whether a carburetor problem exists and document specific faults
  - 3.2 demonstrate how to:
    - 3.2.1 remove, clean and adjust a carburetor
    - 3.2.2 check and/or replace filters
    - 3.2.3 test fuel pump pressure and capacity
    - 3.2.4 clean fuel injectors
- 4. use diagnostic equipment to check, interpret and service an ignition, and to check charging, starting, emission control and exhaust systems**
  - 4.1. demonstrate how to:
    - 4.1.1 use diagnostic equipment to diagnose an ignition system
    - 4.1.2 service spark plugs, wires, a distributor cap, a rotor, points, a pick-up coil, a spark advance
    - 4.1.3 check and adjust ignition timing
    - 4.1.4 operate starter and determine if problem exists; e.g., noises, drive engagement, speed
    - 4.1.5 check starter amperage draw and correct
    - 4.1.6 check starter circuit voltage drops and correct
    - 4.1.7 check battery condition and service
    - 4.1.8 do a visual check; i.e., wires, connections, belt condition/tension
    - 4.1.9 check alternator for noise and vibrations
    - 4.1.10 check alternator output and voltage regulation and correct
    - 4.1.11 check charging circuit voltage drops and correct faults

- 4.1.12 diagnose computer-controlled systems and document faults
- 4.1.13 identify which emissions are being controlled
- 4.1.14 identify what emission control devices exist on a vehicle
- 4.1.15 identify to what standards these devices control emissions
- 4.1.16 check if vehicle meets standards and correct
- 4.1.17 road test vehicle to determine engine performance and driveability
- 4.1.18 compile a report outlining test results, work done and present condition of engine and related parts/systems

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals

## **COURSE MEC3050: ENGINE REPLACEMENT**

**Level:** Advanced

**Prerequisite:** MEC1040: Engine Fundamentals

**Description:** Students remove and install an engine in a chassis.

**Parameters:** Access to an engine lift, tools/equipment and supporting instructions and resources.

**Supporting Courses:** MEC3030: Engine Diagnosis  
MEC3040: Engine Tune-up

**Outcomes:** The student will:

- 1. use engine lifting equipment and related tools safely**
  - 1.1 demonstrate knowledge of types of lifting tools/equipment available for engines
  - 1.2 demonstrate knowledge of where to attach devices
  - 1.3 explain procedures to follow to remove and install an engine
  - 1.4 describe and follow precautions when working with a vehicle equipped with air conditioning
- 2. identify steps involved to prepare a vehicle for engine removal**
  - 2.1 explain how to prepare a vehicle for engine removal
  - 2.2 identify all wiring, hoses, cables and pipes that require disconnecting
  - 2.3 identify units and special fasteners that will be removed
- 3. apply mechanical skills to remove and replace engine accessories**
  - 3.1 identify the most appropriate method and remove and replace the following:
    - 3.1.1 wires
    - 3.1.2 cables
    - 3.1.3 hoses
    - 3.1.4 pipes
    - 3.1.5 accessories
- 4. apply mechanical skills to remove and install an engine in a chassis**
  - 4.1 disconnect and service battery
  - 4.2 drain and dispose of lubricant and coolant
  - 4.3 remove appropriate wires, hoses, cables, pipes and units
  - 4.4 remove and/or install an engine
  - 4.5 dismantle/assemble an engine
  - 4.6 install lubricants/coolant
  - 4.7 service and store a battery
  - 4.8 drain/store or dispose of fluids
  - 4.9 identify the most appropriate method and remove and replace the following:
    - 4.9.1 cylinder head
    - 4.9.2 cylinder block
- 5. perform post-engine installation start-up and adjustment procedures**
  - 5.1 adjust and service an engine
  - 5.2 start engine and check for proper performance
  - 5.3 perform post-engine installation vehicle clean-up for customer pick-up



**6. demonstrate basic competencies**

6.1 demonstrate fundamental skills to:

- 6.1.1 communicate
- 6.1.2 manage information
- 6.1.3 use numbers
- 6.1.4 think and solve problems

6.2 demonstrate personal management skills to:

- 6.2.1 demonstrate positive attitudes and behaviours
- 6.2.2 be responsible
- 6.2.3 be adaptable
- 6.2.4 learn continuously
- 6.2.5 work safely

6.3 demonstrate teamwork skills to:

- 6.3.1 work with others
- 6.3.2 participate in projects and tasks

**7. create a transitional strategy to accommodate personal changes and build personal values**

7.1 identify short-term and long-term goals

7.2 identify steps to achieve goals

## **COURSE MEC3060: ENGINE RECONDITIONING 1**

**Level:** Advanced

**Prerequisite:** MEC1040: Engine Fundamentals

**Description:** Students determine the need for service and perform the required service on the cylinder head and related components of an engine.

**Parameters:** Access to cylinder head rebuilding equipment, measuring tools and related resources.

**Supporting Courses:** MEC3030: Engine Diagnosis  
MEC3040: Engine Tune-up

**Outcomes:** The student will:

- 1. demonstrate safe work procedures related to cylinder head work**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
- 2. determine the condition of a cylinder head before and after disassembly**
  - 2.1 perform checks to determine the condition of a cylinder head and related parts
  - 2.2 describe blueprinting procedures for cylinder heads
  - 2.3 calculate costs of blueprinting
- 3. recondition a cylinder head and its related components**
  - 3.1 clean a cylinder head and related parts
  - 3.2 inspect parts for serviceability
  - 3.3 machine parts
- 4. reassemble and install a cylinder head**
  - 4.1 assemble a cylinder head and check valve spring and stem height
  - 4.2 service push rods, lifters, rocker arms, chains, gears, a camshaft, pulleys and belts
  - 4.3 install a cylinder head and make adjustments
  - 4.4 address unique concerns related to overhead camshaft engines
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks

- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE MEC3070: ENGINE RECONDITIONING 2**

**Level:** Advanced

**Prerequisite:** MEC1040: Engine Fundamentals

**Description:** Students determine the need for service and perform service on a cylinder block assembly and related components of an engine.

**Parameters:** Access to engine measuring tools, cylinder block reconditioning tools/equipment and related resources.

**Supporting Courses:** MEC3030: Engine Diagnosis  
MEC3040: Engine Tune-up  
MEC3060: Engine Reconditioning 1

**Outcomes:** The student will:

- 1. demonstrate safe work procedures while reconditioning a cylinder block**
  - 1.1 demonstrate knowledge of and follow safety practices related to reconditioning cylinder blocks
- 2. determine the condition of a cylinder block before and after disassembly**
  - 2.1 list possible engine problems based on information provided
  - 2.2 describe blueprinting procedures for cylinder blocks
  - 2.3 estimate costs
  - 2.4 clean all engine block components
  - 2.5 inspect the following components for serviceability:
    - 2.5.1 block alignment, warpage and cracks
    - 2.5.2 cylinder(s) size, taper, roundness and general condition
    - 2.5.3 crankshaft bends, cracks, journal size, tapes, roundness and general condition
    - 2.5.4 camshaft(s) bends, lobe/lift wear and journal size
    - 2.5.5 piston(s) size, taper, clearance and condition of pin(s) and grooves
    - 2.5.6 connecting rod(s) big/small-end size and straightness
    - 2.5.7 lifter(s) base wear, rate of leakdown
    - 2.5.8 bearing(s) size and wear
    - 2.5.9 chains, sprockets, pulleys and belts
    - 2.5.10 other
  - 2.6 identify what servicing is required
- 3. recondition a cylinder block and its related components**
  - 3.1 machine/service components, as required
- 4. reassemble a cylinder block assembly**
  - 4.1 assemble an engine block, observing proper tolerances
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE MEC3080: ALTERNATIVE ENERGY SYSTEMS**

**Level:** Advanced

**Prerequisite:** MEC2050: Alternative Fuel Engines

**Description:** Students describe why vehicle manufacturers continue to build the crank-piston internal combustion gasoline engine. Students also identify and describe future engine designs.

**Parameters:** Access to support resources.

**Supporting Course:** MEC1040: Engine Fundamentals

**Outcomes:** The student will:

- 1. research and describe the historical development of piston engine designs from Nicolaus Otto's engine to the present**
  - 1.1 prepare and present a report detailing the origin of the first working internal combustion engine, the major advances made in the design of internal combustion engines and the manufacturing process improvements that made those innovations possible over the history of engine design
  - 1.2 describe the development of and compare the relative efficacy of alternative contemporary design engines to the large-scale manufacture of motor vehicles
- 2. describe the use of different fuels and engine designs in modern vehicles**
  - 2.1 identify the rationale for change in engine design considering environmental and fuel supply issues
  - 2.2 prepare and present a study of initiatives for using alternative fuels in engines and the factors affecting these advancements
  - 2.3 examine and report on the present initiatives to build electric-powered cars and batteries of sufficient capacity to power them
- 3. identify and describe future developments in fuels and engine designs**
  - 3.1 identify which direction of alternative energy systems development promises to be most successful at this time
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks

- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

## **COURSE MEC3090: COMPUTER SYSTEMS**

**Level:** Advanced

**Prerequisite:** MEC2070: Emission Controls

**Description:** Students provide an overview of the applications of computer management systems used in modern vehicles.

**Parameters:** Access to computer management system diagnostic equipment and related resources.

**Supporting Course:** MEC2090: Electrical Components

**Outcomes:** The student will:

- 1. demonstrate established safety and care procedures related to computer management systems**
  - 1.1 demonstrate knowledge of and follow practices that promote safety for people and the environment
- 2. identify the principles that apply to all computer management systems**
  - 2.1 identify the different computer control systems that are now available on vehicles
  - 2.2 explain the functions these computer control systems perform
  - 2.3 state the ways in which these computer control systems replaced mechanical systems
  - 2.4 demonstrate how selected computer control systems work compared to earlier mechanical systems
  - 2.5 identify the principles and functions of computer control systems
- 3. locate the components of selected computer management systems and describe their function**
  - 3.1 locate and identify the parts of selected computer management systems
- 4. demonstrate how computer management systems operate**
  - 4.1 describe the function of the parts of a selected computer management system
  - 4.2 forecast types of computer management systems that may be used on future vehicles
- 5. perform diagnostic analyses of selected computer management systems and make required repairs to or replace malfunctioning parts**
  - 5.1 perform diagnostic analysis of selected computer management systems
  - 5.2 replace parts or make necessary repairs to correct malfunctioning computer management systems
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely

- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE MEC3100: SAFETY SYSTEMS**

**Level:** Advanced

**Prerequisite:** MEC2100: Power Assist Accessories

**Description:** Students describe how safety systems can be tested, diagnosed, replaced or repaired.

**Parameters:** Access to related resources and vehicles with safety systems.

**Note:** Customer work must be checked by a certified technician.

**Supporting Course:** MEC2090: Electrical Components

**Outcomes:** The student will:

- 1. demonstrate established safety and care procedures while working with safety systems**
  - 1.1 demonstrate knowledge of and follow established safety rules when working on safety systems
  - 1.2 demonstrate the use of safety procedures and precautions necessary to avoid damage to vehicle safety systems
- 2. list and compare safety systems that protect vehicle occupants**
  - 2.1 describe vehicle safety systems and indicate the types of systems and dates when various systems were introduced
  - 2.2 explain the effect various safety systems have had in reducing fatalities
  - 2.3 identify and describe which safety systems are most effective in terms of saving human lives, cost of manufacture and ease of use
- 3. diagnose and service vehicle safety systems**
  - 3.1 identify safety systems in selected vehicles
  - 3.2 list the parts of these safety systems
  - 3.3 describe the function of these safety systems
  - 3.4 diagnose the condition and any problems found on safety systems
  - 3.5 replace parts or make repairs to malfunctioning parts of safety systems
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals





## **COURSE MEC3110: CLIMATE CONTROL**

**Level:** Advanced

**Prerequisite:** MEC2030: Lubrication & Cooling

**Description:** Students expand their knowledge of the purpose, operation and servicing of standard heating and air conditioning systems.

**Parameters:** Access to air conditioning test equipment and related resources.

**Note:** Work must be supervised and checked by a certified technician when student is working with refrigerants.

**Outcomes:** The student will:

- 1. demonstrate established safety and care procedures when working with climate control systems**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 generate a list of safety concerns when working with refrigerants
  - 1.3 outline the legal restrictions about the disposal and recycling of R12 refrigerants
  - 1.4 identify the safety and environmental concerns with R12 and R12 replacements
- 2. identify the purpose and describe the functions of heater and air conditioning system components**
  - 2.1 describe the operation of a heater; e.g., heat exchange, the operation of controls for fan speed, air flow controls
  - 2.2 identify components of an air conditioning system
  - 2.3 describe refrigeration principles
  - 2.4 describe air conditioning system operation
- 3. perform inspection, diagnosis, service and repair procedures on heater and air conditioning systems**
  - 3.1 identify the causes and repair procedures for standard heater operation malfunctions; e.g., blocked or leaking heater core, temperature cable adjustment, fan motor noise, vibration, speed abnormalities
  - 3.2 show how to conduct a visual and tactile check of the operation of the refrigerant system and assess the service needs
  - 3.3 identify the cause of malfunction in a climate control system and repair, as required, after consulting with the vehicle owner/teacher
  - 3.4 pressure test the air conditioning refrigerant system and confirm the normalcy of system operation by comparing data with the service manual
  - 3.5 on the air conditioning system, perform a leak test, evacuate system, recharge, then perform leak test again
- 4. identify global concerns about the release of refrigerants into the atmosphere as well as the alternatives to standard refrigerants, and identify the required recycling procedures**
  - 4.1 research the effect of refrigerants on the ecosystem
  - 4.2 research alternate refrigerants

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

6.1 identify short-term and long-term goals

6.2 identify steps to achieve goals

## **COURSE MEC3120: POWER ASSISTING**

**Level:** Advanced

**Prerequisite:** MEC2100: Power Assist Accessories

**Description:** Students further develop their knowledge of the purpose, operation, service and repair of pneumatic, hydraulic and electric power assist devices.

**Parameters:** Access to vacuum/pressure gauges, electrical test equipment and related resources.

**Supporting Course:** MEC2120: Hydraulic Accessories

**Outcomes:** The student will:

- 1. demonstrate established safety and care procedures when working with power assists**
  - 1.1 demonstrate knowledge of and follow established laboratory procedures
- 2. identify applications of power assist components to various vehicle systems and determine the rationale for each application**
  - 2.1 describe situations in vehicle system design where power assist mechanisms are used
  - 2.2 define the advantages of power assist over manual control and identify the type of power assist most appropriate for use in a particular situation such as steering or braking
- 3. perform service and repair procedures to pneumatic, hydraulic and electric power assist devices according to manufacturer's recommendations**
  - 3.1 complete an inspection of a hydraulic power assist device using manufacturer's prescribed diagnostic procedures
  - 3.2 estimate the repair costs for a defective or broken hydraulic assist and confer with the teacher or vehicle owner regarding the repair requirements
  - 3.3 complete an inspection of a pneumatic assist device or system using prescribed diagnostic procedures
  - 3.4 prepare an estimate of the repair requirements of a pneumatic assist and confer with the teacher or vehicle owner regarding the repair needs
  - 3.5 complete an inspection of an electric assist device using a prescribed diagnostic procedure
  - 3.6 prepare an estimate of the repair requirements for an electric assist device and confer with the teacher or vehicle owner regarding the required repairs
  - 3.7 complete a repair procedure on an electric assist device or system
  - 3.8 complete a repair procedure on a hydraulic assist unit
  - 3.9 complete a repair procedure on a pneumatic assist unit or system
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. **create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **MODULE MEC3130: AUTOMATIC TRANSMISSIONS**

**Level:** Advanced

**Prerequisite:** MEC1110: Pneumatics & Hydraulics

**Description:** Students develop knowledge of automatic transmissions and transaxles and skills in diagnosing and executing minor automatic transmission and transaxle repair requirements.

**Parameters:** Access to automatic transmission diagnostic tools and support resources.

**Note:** Customer work must be supervised and checked by a certified technician.

**Supporting Course:** MEC2140: Transmissions/Transaxles

**Outcomes:** The student will:

- 1. demonstrate established safety and care procedures when working with automatic transmissions and transaxles**
  - 1.1 demonstrate knowledge of and follow established laboratory procedures
- 2. identify the parts of a torque converter and automatic transmission or transaxle, and determine the path of power and the shifting control operation in each gear setting**
  - 2.1 describe the operation of a torque converter
  - 2.2 compare the internal structure of a lock-up converter and nonlock-up converter
  - 2.3 identify the parts of a transmission assembly by naming pieces on a diagram or parts of a disassembled unit
  - 2.4 using a hydraulic flow diagram, explain the unit engaged and shift process for each gear position
  - 2.5 interpret shifting characteristics resulting from differentiated inputs; e.g., high road speed, pulling heavy loads, throttle valve position
- 3. inspect, diagnose, service and complete a minor repair to an automatic transmission and transaxle assembly**
  - 3.1 use the service manual and a road test to determine probable causes of noted conditions
  - 3.2 complete diagnostic procedures developed from service inquiry, which may include linkage adjustments, pressure testing and further road testing as well as partial disassembly of the transmission
  - 3.3 perform a stall test according to manufacturer's specifications
  - 3.4 list parts for required repairs
  - 3.5 inspect transmission/transaxle oil level and develop an assessment of its odour and colour
  - 3.6 change transmission fluid and filter as described in the appropriate service manual
  - 3.7 check unit for oil leakage and determine a cause for loss of oil
  - 3.8 repair a fluid leak
  - 3.9 evaluate the condition and adjustment of linkage
  - 3.10 locate and correct a transmission linkage or band adjustment, where required
  - 3.11 remove, clean and reinstall a transmission valve body assembly
- 4. perform a service and repair procedure on an automatic transmission**
  - 4.1 remove, repair or replace an automatic transmission assembly

**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

- 6.1 identify short-term and long-term goals
- 6.2 identify steps to achieve goals

## **COURSE MEC3140: DRIVE TRAIN REPAIR**

**Level:** Advanced

**Prerequisite:** MEC2130: Drive Line

**Description:** Students perform overhauls on clutch, transmission and differential assemblies.

**Parameters:** Access to specialized drive line tools, drive line units and related resources.

**Supporting Course:** MEC2140: Transmissions/Transaxles

**Outcomes:** The student will:

- 1. demonstrate established safe work practices and follow established laboratory procedures**
  - 1.1 demonstrate knowledge of and follow established laboratory procedures
- 2. replace a clutch assembly**
  - 2.1 remove and replace a clutch assembly
  - 2.2 identify the serviceability of each part
  - 2.3 adjust linkage to specified clearance
- 3. explain the operation, removal, overhaul and replacement of a manual transmission/transaxle**
  - 3.1 explain the operation and power flow in various transmissions and transaxles
  - 3.2 remove and replace specified transmission and overhaul to manufacturer's specifications
- 4. describe, measure and adjust a differential assembly**
  - 4.1 describe types of differential assemblies and explain the operation of the following:
    - 4.1.1 full-floating
    - 4.1.2 semi-floating
    - 4.1.3 hunting
    - 4.1.4 non-hunting
  - 4.2 describe the operation of a limited slip differential assembly
  - 4.3 measure and adjust a differential assembly
- 5. describe and overhaul a drive axle assembly**
  - 5.1 describe drive axle operation and components of four-wheel, front-wheel and rear-wheel drive vehicles
  - 5.2 overhaul constant velocity joints
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely

- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE MEC3150: WHEEL ALIGNMENT**

**Level:** Advanced

**Prerequisite:** MEC2150: Suspension Systems

**Description:** Students develop the knowledge, skills and attitudes necessary for repairing and aligning various vehicle steering systems.

**Parameters:** Access to wheel alignment equipment and supporting resources.

**Note:** Customer work must be supervised and checked by a certified technician.

**Supporting Course:** MEC2160: Steering Systems

**Outcomes:** The student will:

- 1. follow established safe work procedures**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
- 2. investigate and determine the condition of various components that affect wheel alignment and tracking**
  - 2.1 solve common steering and suspension problems including:
    - 2.1.1 loose steering
    - 2.1.2 hard steering
    - 2.1.3 vehicle wander
    - 2.1.4 pulling to one side
    - 2.1.5 wheel shimmy
    - 2.1.6 wheel tramp
    - 2.1.7 improper tire wear
- 3. identify measurements and angles used to check and adjust suspension and steering systems**
  - 3.1 define and explain camber, caster, toe, steering axis inclination, toe-out on turns and tracking
- 4. use specialized alignment equipment to check and adjust alignment angles on various suspension types to manufacturer's specifications**
  - 4.1 demonstrate how to:
    - 4.1.1 check and correct tire pressures and determine reason for abnormal tire wear
    - 4.1.2 check and adjust wheel bearings
    - 4.1.3 check and adjust wheel/tire runout
    - 4.1.4 check and correct tire balance
    - 4.1.5 check and correct steering linkage problems
    - 4.1.6 check and adjust steering gear
    - 4.1.7 check and correct shock absorber problems
    - 4.1.8 check and correct riding height
    - 4.1.9 check vehicle tracking
  - 4.2 check alignment angles for a given vehicle using the appropriate alignment equipment
  - 4.3 adjust alignment angles to manufacturer's specifications on at least two different suspension types



**5. demonstrate basic competencies**

5.1 demonstrate fundamental skills to:

- 5.1.1 communicate
- 5.1.2 manage information
- 5.1.3 use numbers
- 5.1.4 think and solve problems

5.2 demonstrate personal management skills to:

- 5.2.1 demonstrate positive attitudes and behaviours
- 5.2.2 be responsible
- 5.2.3 be adaptable
- 5.2.4 learn continuously
- 5.2.5 work safely

5.3 demonstrate teamwork skills to:

- 5.3.1 work with others
- 5.3.2 participate in projects and tasks

**6. create a transitional strategy to accommodate personal changes and build personal values**

6.1 identify short-term and long-term goals

6.2 identify steps to achieve goals

## **COURSE MEC3160: BODY REPAIR ESTIMATION**

**Level:** Advanced

**Prerequisite:** MEC1160: Structures & Materials

**Description:** Students apply knowledge in estimating, including paying close attention to detail in determining the cost of a repair.

**Parameters:** Access to supporting resources.

**Outcomes:** The student will:

- 1. demonstrate established laboratory procedures and safe work practices**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 identify mechanical and electrical components often damaged in collision, and state appropriate safety precautions in dealing with gasoline, oil, air conditioning and battery acid hazards
- 2. identify and describe types of body damage**
  - 2.1 list and describe the terms used in the appraisal industry
  - 2.2 describe vehicle construction systems, e.g., unibody, framed, and safety requirements
  - 2.3 examine the effects of collision on vehicle structure, parts and passenger safety equipment
  - 2.4 demonstrate the effects of forces on metal and show how manufacturing techniques are used to absorb collision energy
  - 2.5 define the terms “primary damage,” “secondary damage” and “hidden damage”
- 3. outline skills needed to successfully estimate collision damage**
  - 3.1 identify related damaged parts
  - 3.2 investigate and describe collision damage to determine direction of damage, identify parts damaged, including hidden damage, and list signs of hidden damage
  - 3.3 conduct tests to determine mechanical and/or electrical functions in order to properly estimate cost of collision damage
- 4. complete an estimate by determining what parts/components are to be replaced or repaired and their subsequent costs**
  - 4.1 estimate cost including parts, labour and miscellaneous
  - 4.2 calculate the cost of original equipment, aftermarket and used parts that could be used in a repair
  - 4.3 complete a replacement parts list for a given collision, including cost, extended cost and contracted costs
  - 4.4 list examples of hidden and other costs that must be included in an estimate of collision damage
  - 4.5 describe the responsibility of the shop to the customer, the insurer and legal parties in doing an estimate; e.g., safety of vehicle
  - 4.6 define write-off and explain when a vehicle is considered a write-off and non-repairable
  - 4.7 explain the advantages of having knowledge of vehicle structure and repair procedures when completing an estimate for repair
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE MEC3170: DAMAGE ANALYSIS**

**Level:** Advanced

**Prerequisite:** MEC2170: Metal Repair & Finishing

**Description:** Students identify and examine physical damage caused by collisions and learn cost estimating procedures.

**Parameters:** Access to a damaged vehicle, measuring gauges and related resources.

**Supporting Courses:** MEC2150: Suspension Systems  
MEC2160: Steering Systems

**Outcomes:** The student will:

**1. demonstrate established safe work procedures**

- 1.1 demonstrate knowledge of and follow established laboratory procedures

**2. identify types and signs of collision damage**

- 2.1 describe manufacturer's methods used in vehicle construction and define the terms used to identify vehicle body parts
- 2.2 describe methods used in vehicle construction to control damage through energy transfer and differences in structural strength
- 2.3 identify the specific occupant safety features built into the vehicle as required by law or provided as a vehicle option
- 2.4 demonstrate basic principles of estimating damage repair and apply to a specific situation
- 2.5 estimate the repair or replacement of safety equipment damaged in a collision
- 2.6 identify the basic frame structures used in auto construction, and describe the measurement charts used to determine misalignment

**3. examine and use measurements to determine the extent of vehicle damage**

- 3.1 calculate frame alignment measurements to determine the extent of misalignment and explain the results of the measurements
- 3.2 use frame gauges and charts
- 3.3 analyze measurements and determine repair procedure

**4. prepare a repair strategy for a given vehicle**

- 4.1 explain the value of using used, aftermarket or original equipment parts in any given repair
- 4.2 complete a damage analysis for a given vehicle
- 4.3 prepare a strategy plan showing correct repair sequence

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals



## **COURSE MEC3180: DAMAGE REPAIR 1**

**Level:** Advanced

**Prerequisite:** MEC2170: Metal Repair & Finishing

**Description:** Students examine the methods used to complete a repair involving removing, replacing and aligning body parts.

**Parameters:** Access to specialized auto body tools, hand tools and related resources.

**Note:** The student must have access to instruction from an individual with journey person qualifications if students are involved in customer work.

**Supporting Course:** MEC3170: Damage Analysis

**Outcomes:** The student will:

**1. demonstrate established safety procedures**

- 1.1 demonstrate knowledge of and follow established laboratory procedures
- 1.2 demonstrate approved safety procedures in the use of jacks, jack stands, impact wrenches, torches, plasma arc and abrasive cutters to remove or replace parts
- 1.3 demonstrate knowledge, skills and attitudes in the safe use of hand tools

**2. follow an approved sequence of repairs involving removing and replacing damaged external parts**

- 2.1 examine damage to external parts and identify appropriate repair sequence
- 2.2 complete a list of required parts and show cost effectiveness of using aftermarket or used parts
- 2.3 list methods used in the manufacture of vehicles to align adjacent parts, including shims, slotted holes and bending
- 2.4 examine the bumper shock system and explain the effects of collision to bumper shocks and their alignment
- 2.5 describe the importance of correct alignment of body parts and the effects of misalignment, both aesthetically and physically

**3. align parts used to repair and prepare components for painting or priming**

- 3.1 demonstrate knowledge and skill in the preparation of existing flanges, edges and mounting points used for the replacement of new parts
- 3.2 safely remove and replace a door, hood and/or trunk lid
- 3.3 replace and align a fender

**4. remove, repair or replace trim parts, as required**

- 4.1 explain the function of trim
- 4.2 identify methods of trim fastening
- 4.3 successfully remove trim and damaged parts, showing knowledge of tools and care for property
- 4.4 install new or original trim and recognize the value of using original equipment trim parts

**5. demonstrate basic competencies**

- 5.1 demonstrate fundamental skills to:
  - 5.1.1 communicate
  - 5.1.2 manage information
  - 5.1.3 use numbers
  - 5.1.4 think and solve problems

- 5.2 demonstrate personal management skills to:
  - 5.2.1 demonstrate positive attitudes and behaviours
  - 5.2.2 be responsible
  - 5.2.3 be adaptable
  - 5.2.4 learn continuously
  - 5.2.5 work safely
- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE MEC3190: DAMAGE REPAIR 2**

**Level:** Advanced

**Prerequisite:** MEC3180: Damage Repair 1

**Description:** Students examine methods used to complete a collision repair involving unibody parts replacement and frame correction.

**Parameters:** Access to hydraulic push/pull equipment, Gas Metal Arc Welding (GMAW) and cutting equipment, basic auto body tools and related resources.

**Note:** The students must have access to instruction from an individual with journeyperson qualifications if they are involved in customer work.

**Supporting Courses:** MEC2150: Suspension Systems  
MEC2160: Steering Systems  
MEC2170: Metal Repair & Finishing  
MEC2190: Surface Preparation 2

**Outcomes:** The student will:

- 1. demonstrate established safe work procedures**
  - 1.1 demonstrate knowledge of and follow laboratory safety procedures
  - 1.2 demonstrate safety procedures required in the use of hydraulic jacks, GMAW welding and oxyacetylene and/or plasma arc cutting equipment
  - 1.3 list the safety implications of collision damage causing suspension misalignment, including legal implications
- 2. describe construction features and materials used in vehicle bodies and methods of repair**
  - 2.1 identify and describe three kinds of frame structures, giving the advantages and applications of each
  - 2.2 define the terms high strength steel (HSS) and high strength low alloy (HSLA) steel, and explain the need for these metals in unibody construction
  - 2.3 describe the bench system used by professional auto repair shops in unibody collision repair
- 3. identify misalignment of frame and suspension parts and components**
  - 3.1 describe and use measurements and measurement charts to determine the degree of misalignment
  - 3.2 define the terms “twist,” “sag,” “sway” and “diamond”
  - 3.3 describe measurements that will indicate each of the above conditions
- 4. use a bench frame-straightening system and related measurements to straighten/align a component**
  - 4.1 use a bench, or equivalent, frame-straightening system to correct alignment
  - 4.2 align and fabricate damaged parts
- 5. correct frame/body alignment involving replacement of unibody panels and use of hydraulic jacks and welders**
  - 5.1 describe the correct procedure used to repair a unibody frame that shows misalignment
  - 5.2 demonstrate how to use hydraulic jacking systems in the repair of collision damage

- 6. explain the importance of proper frame and suspension alignment, including legal implications**
  - 6.1 identify three kinds of suspension systems used by automakers
  - 6.2 define the terms toe-in, camber and castor, and explain how each affects car tracking and driveability
- 7. demonstrate basic competencies**
  - 7.1 demonstrate fundamental skills to:
    - 7.1.1 communicate
    - 7.1.2 manage information
    - 7.1.3 use numbers
    - 7.1.4 think and solve problems
  - 7.2 demonstrate personal management skills to:
    - 7.2.1 demonstrate positive attitudes and behaviours
    - 7.2.2 be responsible
    - 7.2.3 be adaptable
    - 7.2.4 learn continuously
    - 7.2.5 work safely
  - 7.3 demonstrate teamwork skills to:
    - 7.3.1 work with others
    - 7.3.2 participate in projects and tasks
- 8. create a transitional strategy to accommodate personal changes and build personal values**
  - 8.1 identify short-term and long-term goals
  - 8.2 identify steps to achieve goals



## **COURSE MEC3200: REFINISHING 2**

**Level:** Advanced

**Prerequisite:** MEC2200: Refinishing 1

**Description:** Students demonstrate finishing skills and techniques related to the preparation and application of metallic paints.

**Parameters:** Access to spray equipment and related resources.

**Outcomes:** The student will:

- 1. demonstrate safe work practices and follow all warnings identified by product manufacturers, Workplace Hazardous Materials Information System (WHMIS), and Occupational Health and Safety**
  - 1.1 demonstrate knowledge of health hazards and environmental impacts of products used
  - 1.2 demonstrate use of personal protective equipment as recommended by manufacturer
- 2. describe topcoats, solvents and additives used in surface finishes**
  - 2.1 identify three types of topcoats and describe characteristics showing similarities and differences
  - 2.2 demonstrate and explain correct procedures in preparing topcoats for application including correct selection of solvents and additives
- 3. apply metallic, tutone, base/clear coat and acrylic enamel finishes**
  - 3.1 identify and select colour and type of paint for given vehicle identification plates and code books
  - 3.2 identify differences in spray gun types and uses
  - 3.3 describe refinishing equipment accessories
  - 3.4 select, mix and apply two or more of the following finishes:
    - 3.4.1 acrylic enamel
    - 3.4.2 metallic
    - 3.4.3 tutone
    - 3.4.4 base/clear coat
  - 3.5 complete a vehicle recoat
- 4. apply problem-solving techniques to paint and equipment problems**
  - 4.1 solve paint and equipment problems observed during application
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely



- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. **create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals

## **COURSE MEC3210: PLASTIC & FIBREGLASS**

**Level:** Advanced

**Prerequisite:** MEC1160: Structures & Materials

**Description:** Students determine the types of plastic and fibreglass materials required for repairs and perform appropriate repair procedures.

**Parameters:** Access to plastic welding equipment and related materials and resources.

**Outcomes:** The student will:

- 1. identify hazards and safety precautions to be observed when working with plastics**
  - 1.1 demonstrate knowledge of and follow accepted safety practices when working with hot liquids, plastic solvents, resins and equipment
- 2. describe types of plastics, welding equipment and bonding processes used to repair plastic parts**
  - 2.1 identify and state characteristics of plastics used in vehicle manufacture
  - 2.2 identify plastics that can be repaired by welding and bonding
  - 2.3 explain the types of plastic welding equipment available and when this repair process should be used
  - 2.4 identify welding rods
  - 2.5 explain which bonding agents are available and their application
  - 2.6 identify types of plastic and decide whether to weld or bond
  - 2.7 state why a particular process was chosen
- 3. apply plastic welding and/or bonding techniques to repair a plastic component**
  - 3.1 identify correct layout
  - 3.2 prepare “witness lines” for repeat layout
  - 3.3 prepare/clean plastic material as per instructions for process used
  - 3.4 create a solid lay-up
  - 3.5 weld/bond materials
  - 3.6 prepare damaged area
  - 3.7 prepare material
  - 3.8 apply material
- 4. identify types of fibreglass materials and repair procedures**
  - 4.1 identify three kinds of fibreglass material
  - 4.2 identify and describe related resin/hardeners and repair procedures
- 5. perform a fibreglass repair on a component**
  - 5.1 using safe handling techniques and prepare damaged area
  - 5.2 demonstrate correct application of material
  - 5.3 demonstrate approved finishing steps
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems

- 6.2 demonstrate personal management skills to:
  - 6.2.1 demonstrate positive attitudes and behaviours
  - 6.2.2 be responsible
  - 6.2.3 be adaptable
  - 6.2.4 learn continuously
  - 6.2.5 work safely
- 6.3 demonstrate teamwork skills to:
  - 6.3.1 work with others
  - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE MEC3220: GLASS REPLACEMENT**

**Level:** Advanced

**Prerequisite:** MEC2180: Trim Replacement

**Description:** Students demonstrate knowledge, skills and practice related to vehicle glass installation and adjustment.

**Parameters:** Access to glass removal tools, related materials/resources and glazed vehicles.

**Outcomes:** The student will:

- 1. handle glass and related materials safely**
  - 1.1 identify safety concerns when working with glass
  - 1.2 show knowledge of safety procedures needed in glass removal
  - 1.3 identify installation product safety concerns in the glass industry
- 2. identify glass types and glass retaining systems**
  - 2.1 identify types of glass and retaining systems used in the auto industry
  - 2.2 outline the removal procedures required for two different systems
  - 2.3 show knowledge of trim parts used around glass
- 3. demonstrate knowledge of tools and procedures used by glass technicians**
  - 3.1 identify moulding retainers, glass seal products and procedures for installation
  - 3.2 identify door glass adjustment methods
- 4. complete glass removal installations and adjustments**
  - 4.1 remove front or rear glass following safety guidelines
  - 4.2 install several glass systems, including door glass and side lights
  - 4.3 adjust door glass on several different systems
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely
  - 5.3 demonstrate teamwork skills to:
    - 5.3.1 work with others
    - 5.3.2 participate in projects and tasks
- 6. create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals





## **COURSE MEC3230: REFINISHING 3**

**Level:** Advanced

**Prerequisite:** MEC3200: Refinishing 2

**Description:** Students demonstrate knowledge and skills of advanced finishing techniques, including custom painting, mixing, tinting, colour and texture matching.

**Parameters:** Access to spray equipment, surface repair equipment and related resources.

**Outcomes:** The student will:

- 1. demonstrate safe work practices, and follow all product warnings and labels identified by the product manufacturers, Workplace Hazardous Materials Information System (WHMIS), and Occupational Health and Safety**
  - 1.1 demonstrate knowledge of health hazards and environmental impacts of products used
  - 1.2 demonstrate knowledge of special procedures in the preparation of plastic and vinyl parts
- 2. investigate and describe advanced products, techniques and equipment used to achieve an acceptable original equipment manufacturer finish**
  - 2.1 explain alternative spray equipment
  - 2.2 describe types and uses of spray booths
  - 2.3 explain compressors and drying systems
  - 2.4 identify styles and techniques of custom painting
  - 2.5 explain mixing and tinting systems
  - 2.6 analyze colour/texture and identify the following:
    - 2.6.1 lightness/darkness
    - 2.6.2 cast
    - 2.6.3 brightness
  - 2.7 describe how colours are matched
  - 2.8 explain how to create textured finishes
  - 2.9 describe various paint mixing/tinting procedures
- 3. apply an advanced level finish**
  - 3.1 demonstrate advanced topcoat application techniques
  - 3.2 identify styles and techniques of custom painting
  - 3.3 apply a custom paint job
  - 3.4 perform advanced troubleshooting of application/equipment problems
  - 3.5 demonstrate proper selection and application of colour coats for plastic and vinyl
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems

- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals

**COURSE MEC3910: MEC PROJECT D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:** The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

**COURSE MEC3920: MEC PROJECT E**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students develop project design and management skills to extend and enhance competencies and skills in other Career and Technology Studies (CTS) courses through contexts that are personally relevant.

**Parameters:** This course must connect with a minimum of two CTS courses, of which one must be at the advanced level and the other must be at least at the intermediate level.

**All projects and/or performances, whether teacher- or student-led, must include a course outline or student proposal.**

**Outcomes:** The teacher/student will:

- 1. identify the two or more CTS courses linked to this course**
  - 1.1 justify the connection
  - 1.2 identify key outcomes
- 2. propose, manage and assess a project and/or performance**
  - 2.1 identify a project and/or performance that:
    - 2.1.1 prepares a plan
    - 2.1.2 clarifies the purposes
    - 2.1.3 defines deliverables
    - 2.1.4 specifies time lines
    - 2.1.5 explains terminology, tools and processes
    - 2.1.6 defines resources; e.g., materials, costs, staffing
  - 2.2 identify and comply with all related health and safety standards
  - 2.3 define assessment standards (indicators for success)
  - 2.4 present the proposal and obtain necessary approvals

The student will:

- 3. meet goals as defined within the plan**
  - 3.1 complete the project and/or performance as outlined
  - 3.2 monitor the project and/or performance and make necessary adjustments
  - 3.3 present the project and/or performance indicating the:
    - 3.3.1 outcomes attained
    - 3.3.2 relationship of outcomes to goals originally set
  - 3.4 evaluate the project and/or performance indicating the:
    - 3.4.1 processes and strategies used
    - 3.4.2 recommendations on how the project and/or performance could have been improved



**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE ASA3400: BASIC TOOLS & MATERIALS**

**Level:** First Period Apprenticeship, Group A

**Prerequisite:** None

**Description:** Students develop knowledge, skills and attitudes in the practice of workshop safety, communication and the use of specialty hand tools, measuring tools and fasteners.

**Parameters:** Access to a materials work centre, complete with basic measuring tools, specialty hand tools and fastening devices, and to instruction from an individual with specialized training and/or an automotive service technician.

**ILM Resources:** Communication – Part A 090101aA, Communication – Part B 090101aB, Measuring Tools 090101b, Specialty Hand Tools 090101c, Fastening Devices 090101d, Safety 090101e

**Outcomes:** The student will:

**1. practise workshop safety at all times**

- 1.1 identify key areas of responsibility that an employee has in regard to safety
- 1.2 demonstrate safe work habits related to:
  - 1.2.1 housekeeping
  - 1.2.2 electrical tools and rotating machinery
  - 1.2.3 flammable liquids and gases
  - 1.2.4 fire safety
  - 1.2.5 compressed air
  - 1.2.6 jacking and hoisting
- 1.3 demonstrate correct procedures for working with exhaust gases including:
  - 1.3.1 ventilation procedures
  - 1.3.2 emergencies
  - 1.3.3 wellness

**2. communicate with customers and related tradespeople, using industry standard terms and units for parts and operations**

- 2.1 name standard terms and units of measure for components and operations including:
  - 2.1.1 benefits
  - 2.1.2 common measurement terms
- 2.2 effectively communicate trade-related information with customers, e.g., difficult customers, suppliers and other tradespeople; use telephone communication

**3. demonstrate the correct use of hand tools common to the trade**

- 3.1 perform double and ISO tube flaring
- 3.2 demonstrate the following knowledge of drills and reamers:
  - 3.2.1 twist drills
  - 3.2.2 drill problems
  - 3.2.3 reamers
- 3.3 demonstrate correct use of taps and dies
- 3.4 demonstrate thread repair and broken fastener removal using:
  - 3.4.1 thread repair techniques
  - 3.4.2 broken stud and bolt removal

- 4. measure components, using measuring tools that are common to the trade**
  - 4.1 convert numbers between decimals and fractions by:
    - 4.1.1 converting fractions to decimals
    - 4.1.2 converting decimals to fractions
  - 4.2 perform linear measurements in imperial and SI units using:
    - 4.2.1 linear measurement
    - 4.2.2 calibrated measuring tools
    - 4.2.3 slide callipers
    - 4.2.4 transfer gauges
  - 4.3 demonstrate correct care and use of measuring tools including:
    - 4.3.1 basic care
    - 4.3.2 adjusting and calibrating vernier-type tools
    - 4.3.3 adjusting and calibrating micrometer-type tools
  - 4.4 perform torque measurements in imperial and SI units; e.g., measure torque
- 5. assemble components, using a variety of fasteners, adhesives and sealers common to the trade**
  - 5.1 identify and demonstrate fastening and torquing procedures using threaded fasteners:
    - 5.1.1 terminology
    - 5.1.2 types of threaded fasteners
    - 5.1.3 bolt grades/property classes
    - 5.1.4 bolt identification
    - 5.1.5 studs
    - 5.1.6 machine screws
    - 5.1.7 self-threading screws
    - 5.1.8 nuts
    - 5.1.9 washers
    - 5.1.10 use of torque wrenches
  - 5.2 demonstrate the use of other retaining devices including:
    - 5.2.1 snap rings and clips
    - 5.2.2 set screws
    - 5.2.3 keys
    - 5.2.4 splines
    - 5.2.5 pins
  - 5.3 demonstrate the use of sealers and adhesives common to the trade
- 6. demonstrate basic competencies**
  - 6.1 demonstrate fundamental skills to:
    - 6.1.1 communicate
    - 6.1.2 manage information
    - 6.1.3 use numbers
    - 6.1.4 think and solve problems
  - 6.2 demonstrate personal management skills to:
    - 6.2.1 demonstrate positive attitudes and behaviours
    - 6.2.2 be responsible
    - 6.2.3 be adaptable
    - 6.2.4 learn continuously
    - 6.2.5 work safely
  - 6.3 demonstrate teamwork skills to:
    - 6.3.1 work with others
    - 6.3.2 participate in projects and tasks
- 7. create a transitional strategy to accommodate personal changes and build personal values**
  - 7.1 identify short-term and long-term goals
  - 7.2 identify steps to achieve goals

## **COURSE ASA3405: ELECTRICAL FUNDAMENTALS**

**Level:** First Period Apprenticeship, Group D

**Prerequisite:** ASA3400: Basic Tools & Materials

**Description:** Students identify and describe the operating principles and applications of electricity.

**Parameters:** Access to a materials work centre, complete with related battery tools, test equipment and electrical supplies, and to instruction from an individual with journeyperson certification as an automotive service technician.

**ILM Resources:** Electrical Fundamentals I 090106a, Fundamentals of Magnetism 090106c, Batteries 090106d

**Outcomes:** The student will:

### **1. apply scientific principles to explain basic electrical theory**

- 1.1 explain the physical qualities of insulators, conductors and semi-conductors including:
  - 1.1.1 atoms and molecules
  - 1.1.2 conductors
  - 1.1.3 semi-conductors
  - 1.1.4 insulators
  - 1.1.5 conductor insulation
- 1.2 explain the following physical qualities and units of measure of electromotive force, current, resistance and power:
  - 1.2.1 voltage (electromotive force)
  - 1.2.2 resistance
  - 1.2.3 current (intensity of electron flow)
  - 1.2.4 electrical circuits
  - 1.2.5 electrical power
  - 1.2.6 electrical failures

### **2. apply scientific principles to explain the fundamentals of magnetism**

- 2.1 explain magnetism and electromagnetism and their properties including:
  - 2.1.1 magnetism principles and properties
  - 2.1.2 magnetic fields
  - 2.1.3 permeability
  - 2.1.4 permanent magnetism
  - 2.1.5 electromagnetism
- 2.2 explain the construction and operation of electromagnetic coils including:
  - 2.2.1 electromagnets
  - 2.2.2 induction
  - 2.2.3 self-induction
  - 2.2.4 mutual induction
- 2.3 explain how magnetism or electromagnetism can be used to:
  - 2.3.1 change electrical energy into mechanical energy
  - 2.3.2 change mechanical energy into electrical energy

3. **test, service and diagnose problems related to batteries**
  - 3.1 explain the purpose, construction, operation and ratings of batteries
  - 3.2 prepare, test and service batteries
  - 3.3 diagnose problems attributed to batteries
  - 3.4 perform battery charging and boosting operations
4. **demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
5. **create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



## **COURSE ASA3410: ELECTRICAL CIRCUITS & DIAGNOSIS**

**Level:** First Period Apprenticeship, Group D

**Prerequisites:** ASA3400: Basic Tools & Materials  
ASA3405: Electrical Fundamentals

**Description:** Students develop the necessary knowledge, skills and attitudes to identify the applications of electricity in circuits to solve electrical problems in a vehicle.

**Parameters:** Access to a materials work centre, complete with equipment, supplies and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

**ILM Resources:** Electrical Circuits 090106b, Electrical Systems Diagnosis I 090106e, Introduction to Scan Tools 090107a

**Outcomes:** The student will:

### **1. solve problems related to automotive electrical systems**

- 1.1 recognize common electrical symbols used in the trade
- 1.2 identify the three basic circuit types and their basic properties
- 1.3 identify and explain an open, shorted and grounded circuit
- 1.4 calculate, using Ohm's law, for any of its variables when two are known
- 1.5 apply Ohm's law to a circuit to calculate voltage, current and resistance, as well as determine the effects of circuit faults on a circuit:
  - 1.5.1 reading simple circuit diagrams
  - 1.5.2 calculating total resistance of circuits, parallel and series-parallel circuits
  - 1.5.3 applying Ohm's law to circuit diagrams
  - 1.5.4 diagnosing circuit faults
- 1.6 calculate electrical power and explain the implications of power requirements in circuit design
- 1.7 perform voltage drop and circuit resistance measurements, using a voltmeter to:
  - 1.7.1 test equipment
  - 1.7.2 check inputs
  - 1.7.3 measure voltage
- 1.8 perform parasitic drain and current draw tests, using an ammeter
- 1.9 measure electrical resistance, using an ohmmeter

### **2. test and repair simple electrical circuits**

- 2.1 correctly use a voltmeter, an ammeter, an ohmmeter or a test light to identify a shorted, open or grounded electrical circuit by:
  - 2.1.1 testing devices
  - 2.1.2 determining the type of problem
  - 2.1.3 tracing circuit problems
- 2.2 perform a simple wire and connector circuit by:
  - 2.2.1 opening a wiring harness
  - 2.2.2 repairing wire
- 2.3 demonstrate an ability to master the hazards associated with electrostatic discharge and vehicle electronic systems

**3. demonstrate a basic understanding of scan tools and their use**

- 3.1 perform the basic functions of generic and original equipment manufacturer scan tools by:
  - 3.1.1 identifying a scan tool
  - 3.1.2 using a diagnostic connector
  - 3.1.3 connecting a scan tool
  - 3.1.4 entering vehicle information
  - 3.1.5 navigating menus
  - 3.1.6 using diagnostic trouble codes (DTC)
  - 3.1.7 erasing DTCs
- 3.2 perform diagnostic and function tests on anti-lock brake systems (ABS) and restraint systems by using:
  - 3.2.1 a diagnostic approach
  - 3.2.2 service literature
  - 3.2.3 a supplemental inflatable restraint diagnosis
  - 3.2.4 an ABS diagnosis

**4. demonstrate basic competencies**

- 4.1 demonstrate fundamental skills to:
  - 4.1.1 communicate
  - 4.1.2 manage information
  - 4.1.3 use numbers
  - 4.1.4 think and solve problems
- 4.2 demonstrate personal management skills to:
  - 4.2.1 demonstrate positive attitudes and behaviours
  - 4.2.2 be responsible
  - 4.2.3 be adaptable
  - 4.2.4 learn continuously
  - 4.2.5 work safely
- 4.3 demonstrate teamwork skills to:
  - 4.3.1 work with others
  - 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals

## **COURSE ASA3415: FRAMES, SUSPENSION & STEERING LINKAGES**

**Level:** First Period Apprenticeship, Group B

**Prerequisite:** ASA3400: Basic Tools & Materials

**Description:** Students develop the knowledge, skills and attitudes necessary to service and maintain vehicle frames, wheel hubs and tires, and suspension and linkage systems.

**Parameters:** Access to a materials work centre, complete with access to hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

**ILM Resources:** Frames 090104a, Suspension and Steering Linkage Systems 090104b, Wheels, Hubs and Tires 090104c

**Outcomes:** The student will:

### **1. identify automotive frame damage**

- 1.1 identify frame damage, using knowledge of frame construction, design features and frame types
- 1.2 perform frame checking procedures

### **2. service and repair suspension systems and steering linkages**

- 2.1 describe the construction and design features of common suspension systems including:
  - 2.1.1 springs
  - 2.1.2 shock absorbers
  - 2.1.3 stabilizer bars
  - 2.1.4 control arms
  - 2.1.5 suspension bushings
  - 2.1.6 ball joints
  - 2.1.7 automotive suspension designs
- 2.2 explain the principles of operation of suspension systems
- 2.3 diagnose and service suspension systems including:
  - 2.3.1 suspension diagnosis
  - 2.3.2 suspension overhaul and repair
- 2.4 identify steering linkage types and explain their operation
- 2.5 diagnose and service steering linkages including:
  - 2.5.1 steering inspection and diagnosis
  - 2.5.2 steering linkage component replacement

### **3. diagnose and service wheels, tires and wheel bearings**

- 3.1 explain the construction, sizing, rating and design features of tires and wheels
- 3.2 demonstrate the correct procedures for balancing and installing wheels and tires including:
  - 3.2.1 wheel balance
  - 3.2.2 wheel balancing methods
  - 3.2.3 tire rotation
  - 3.2.4 wheel fasteners
- 3.3 perform the correct inspection, cleaning and repacking of wheel bearings
- 3.4 demonstrate the correct procedures to install and adjust wheel bearings

3.5 diagnose problems related to servicing wheels, tires and wheel bearings including:

- 3.5.1 tire wear
- 3.5.2 tire replacement
- 3.5.3 tire repair

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

- 5.1 identify short-term and long-term goals
- 5.2 identify steps to achieve goals



## **COURSE ASA3420: MANUAL & POWER STEERING SYSTEMS**

**Level:** First Period Apprenticeship, Group B

**Prerequisites:** ASA3400: Basic Tools & Materials  
ASA3410: Electrical Circuits & Diagnosis

**Description:** Students develop the knowledge, skills and attitudes necessary to service and maintain manual and power steering systems.

**Parameters:** Access to a materials work centre, complete with access to hand tools, specialized tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

**ILM Resources:** Manual Steering 090104d, Power Steering 090104e

**Outcomes:** The student will:

### **1. diagnose, service and repair manual steering gear assemblies**

- 1.1 explain the construction and design features of common manual steering gears including:
  - 1.1.1 steering gears
  - 1.1.2 function
  - 1.1.3 types of steering gears
- 1.2 adjust, repair and diagnose problems related to manual steering gears including:
  - 1.2.1 steering gear overhaul
  - 1.2.2 rack and pinion
  - 1.2.3 lubrication
  - 1.2.4 diagnosis
  - 1.2.5 vehicle wandering
  - 1.2.6 steering roughness

### **2. diagnose, service and repair power steering systems**

- 2.1 explain the construction and design features of power steering gears
- 2.2 identify power steering pump types and explain their operation
- 2.3 explain the principles of operation of power steering systems
- 2.4 diagnose, service, repair and adjust non-rack and pinion power steering gears
- 2.5 diagnose, service, repair and adjust rack and pinion power steering gears
- 2.6 diagnose power steering problems

### **3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely



- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks
- 4. **create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE ASA3425: STEERING ANGLES, STEERING COLUMNS & RESTRAINT SYSTEMS**

**Level:** First Period Apprenticeship, Group B

**Prerequisites:** ASA3400: Basic Tools & Materials  
ASA3410: Electrical Circuits & Diagnosis  
ASA3415: Frames, Suspension & Steering Linkages

**Description:** Students develop the necessary knowledge, skills and attitudes to describe steering angles, service and repair steering columns, and diagnose and service passive and active restraint systems.

**Parameters:** Access to a materials work centre, complete with access to steering columns, specialized tools, vehicles with safety systems and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

**ILM Resources:** Steering Columns 090104h, Steering Angles 090104f,  
Active Restraint Systems 090108a, Passive Restraint Systems 090108b

**Outcomes:** The student will:

- 1. service and repair steering columns and their related safety devices**
  - 1.1 explain the construction, design features and operation of steering column safety features
  - 1.2 service and repair steering columns and related safety devices
  - 1.3 safely disarm, remove, install and re-arm a steering column air bag
- 2. describe the common steering angles and how each affects vehicle handling**
  - 2.1 describe the function and effect of caster on vehicle operation including:
    - 2.1.1 purposes of caster
    - 2.1.2 measuring caster
    - 2.1.3 effects of incorrect caster
  - 2.2 describe the function and effect of camber on vehicle operation including:
    - 2.2.1 purposes of camber
    - 2.2.2 measuring of camber
    - 2.2.3 effects of incorrect camber
  - 2.3 describe the function and effect of steering axis inclination (SAI) on vehicle operation including:
    - 2.3.1 purposes of SAI
    - 2.3.2 measuring SAI
    - 2.3.3 effects of scrub radius
  - 2.4 describe the function and effect of toe on vehicle operation including:
    - 2.4.1 purpose of toe
    - 2.4.2 measuring toe
    - 2.4.3 effects of incorrect toe
    - 2.4.4 toe change
    - 2.4.5 turning radius
    - 2.4.6 measuring turning radius
    - 2.4.7 effects of incorrect turning radius

- 2.5 describe the effect of thrust angle on vehicle operation including:
  - 2.5.1 measuring thrust angle
  - 2.5.2 effects of incorrect thrust angle
- 2.6 describe the measurement procedures for each wheel alignment angle including:
  - 2.6.1 alignment measuring equipment
- 2.7 describe the adjustment procedures for each wheel alignment angle including:
  - 2.7.1 rear camber and toe adjustments
  - 2.7.2 front caster and camber adjustments
  - 2.7.3 front toe adjustment
- 3. describe the purpose, function and operation of active passenger restraint systems**
  - 3.1 explain the purpose of active restraint systems including:
    - 3.1.1 child safety seats
    - 3.1.2 head restraints
  - 3.2 identify the components of the following active restraint systems:
    - 3.2.1 front seat belt
    - 3.2.2 child safety seat
    - 3.2.3 rear seat belt
  - 3.3 identify seat belt service precautions
- 4. diagnose and service passive restraint systems**
  - 4.1 explain the purpose of passive restraint systems related to:
    - 4.1.1 a frontal collision
    - 4.1.2 stages of operation
    - 4.1.3 a front passenger air bag
    - 4.1.4 side collision
  - 4.2 identify components of a passive restraint system including:
    - 4.2.1 passenger air bag inflator module
    - 4.2.2 side impact air bag system
    - 4.2.3 seat belt pre-tensioners
    - 4.2.4 safety glass
    - 4.2.5 passive seat belts
  - 4.3 diagnose and service passive restraint systems by reviewing
    - 4.3.1 special handling precautions
    - 4.3.2 diagnostic procedures
    - 4.3.3 trouble codes
    - 4.3.4 system deactivation procedures
    - 4.3.5 system reactivation procedures
    - 4.3.6 the inspection required after a non-deployment collision
- 5. demonstrate basic competencies**
  - 5.1 demonstrate fundamental skills to:
    - 5.1.1 communicate
    - 5.1.2 manage information
    - 5.1.3 use numbers
    - 5.1.4 think and solve problems
  - 5.2 demonstrate personal management skills to:
    - 5.2.1 demonstrate positive attitudes and behaviours
    - 5.2.2 be responsible
    - 5.2.3 be adaptable
    - 5.2.4 learn continuously
    - 5.2.5 work safely

- 5.3 demonstrate teamwork skills to:
  - 5.3.1 work with others
  - 5.3.2 participate in projects and tasks
- 6. **create a transitional strategy to accommodate personal changes and build personal values**
  - 6.1 identify short-term and long-term goals
  - 6.2 identify steps to achieve goals





## **COURSE ASA3430: WHEEL ALIGNMENT PROCEDURES**

<b>Level:</b>	First Period Apprenticeship, Group B
<b>Prerequisites:</b>	ASA3400: Basic Tools & Materials ASA3410: Electrical Circuits & Diagnosis ASA3415: Frames, Suspension & Steering Linkages ASA3420: Manual & Power Steering Systems
<b>Description:</b>	Students develop the necessary knowledge, skills and attitudes to diagnose and correct suspension and steering problems and to perform wheel alignments.
<b>Parameters:</b>	Access to a materials work centre, complete with access to steering and suspension systems, specialized tools and resources to perform a wheel alignment, and to instruction from an individual with journey person certification as an automotive service technician.
<b>ILM Resources:</b>	Suspension and Steering Diagnosis 090104i, Alignment Procedures 090104g
<b>Outcomes:</b>	The student will: <ul style="list-style-type: none"><li><b>1. diagnose and correct suspension and steering problems</b><ul style="list-style-type: none"><li>1.1 diagnose problems related to steering systems</li><li>1.2 diagnose problems related to suspension systems including:<ul style="list-style-type: none"><li>1.2.1 alignment diagnosis</li></ul></li><li>1.3 choose the most appropriate repair methods to correct suspension and steering problems</li></ul></li><li><b>2. perform a wheel alignment</b><ul style="list-style-type: none"><li>2.1 perform a pre-alignment inspection to locate and identify faulty components</li><li>2.2 select the most appropriate alignment settings within specifications for a given vehicle type and load condition by:<ul style="list-style-type: none"><li>2.2.1 selecting angles</li></ul></li><li>2.3 perform a wheel alignment to adjust the alignment angles according to guidelines</li><li>2.4 adjust steering linkage to establish the correct toe setting and properly centre the steering wheel</li><li>2.5 perform a road test of a vehicle to verify correct alignment or confirm alignment problems</li></ul></li><li><b>3. demonstrate basic competencies</b><ul style="list-style-type: none"><li>3.1 demonstrate fundamental skills to:<ul style="list-style-type: none"><li>3.1.1 communicate</li><li>3.1.2 manage information</li><li>3.1.3 use numbers</li><li>3.1.4 think and solve problems</li></ul></li><li>3.2 demonstrate personal management skills to:<ul style="list-style-type: none"><li>3.2.1 demonstrate positive attitudes and behaviours</li><li>3.2.2 be responsible</li><li>3.2.3 be adaptable</li><li>3.2.4 learn continuously</li><li>3.2.5 work safely</li></ul></li><li>3.3 demonstrate teamwork skills to:<ul style="list-style-type: none"><li>3.3.1 work with others</li><li>3.3.2 participate in projects and tasks</li></ul></li></ul></li></ul>

- 4. create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE ASA3435: BRAKING SYSTEMS I**

**Level:** First Period Apprenticeship, Group C

**Prerequisite:** ASA3400: Basic Tools & Materials

**Description:** Students develop the necessary knowledge, skills and attitudes concerning the basic construction of braking systems and the application of hydraulics to braking components.

**Parameters:** Access to a materials work centre, complete with braking and other hydraulic systems, basic hand tools, specialized brake tools and related resources, as well as to instruction from an individual with journey person certification as an automotive service technician.

**ILM Resources:** Brake System Fundamentals 090105a, Hydraulic System Components 090105b

**Outcomes:** The student will:

### **1. apply scientific principles to explain brake system operation**

- 1.1 explain the principles of operating of brake systems including:
  - 1.1.1 the purpose of a brake system
  - 1.1.2 work, torque and power
  - 1.1.3 energy
- 1.2 state Pascal's law and its implications for brake systems including:
  - 1.2.1 hydraulics
- 1.3 choose the correct brake fluid for a given application based on purpose, function and characteristics of brake fluids including:
  - 1.3.1 brake fluid requirements
  - 1.3.2 rubber compatibility of brake fluid
  - 1.3.3 composition of brake fluid

### **2. service and repair brake system hydraulic components**

- 2.1 explain the principles of operation, construction and design features of common types of brake master cylinders
- 2.2 explain the principles of operation, construction and design features of wheel cylinders and disc brake callipers used in disc brake systems
- 2.3 explain the construction and design features of brake hoses and lines including:
  - 2.3.1 fluid lines
- 2.4 explain the purpose and operation of the metering, proportioning and pressure differential valves
- 2.5 describe the operation of the hydraulic components when used as a system
- 2.6 diagnose, service, adjust and repair brake system hydraulic components including:
  - 2.6.1 master cylinder
  - 2.6.2 wheel cylinders
  - 2.6.3 fluid lines

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks

**4. create a transitional strategy to accommodate personal changes and build personal values**

- 4.1 identify short-term and long-term goals
- 4.2 identify steps to achieve goals

## **COURSE ASA3440: BRAKING SYSTEMS II**

**Level:** First Period Apprenticeship, Group C

**Prerequisites:** ASA3400: Basic Tools & Materials  
ASA3435: Braking Systems I

**Description:** Students develop the necessary knowledge, skills and attitudes to diagnose, service and maintain a braking system according to accepted trade practices.

**Parameters:** Access to a materials work centre, complete with specialized brake tools and related resources, and to instruction from an individual with journeyperson certification as an automotive service technician.

**ILM Resources:** Drum Brake Systems 090105c, Disc Brake Systems 090105d

**Outcomes:** The student will:

### **1. service and repair drum brake systems**

- 1.1 explain the construction, design features and operation of drum brake system components including:
  - 1.1.1 design and basic operation
  - 1.1.2 terminology
  - 1.1.3 drum brake components
- 1.2 service, adjust and repair drum brake systems
  - 1.2.1 service a brake drum
  - 1.2.2 service wheel cylinders
  - 1.2.3 service the backing plate
  - 1.2.4 inspect and/or replace brake shoes
  - 1.2.5 inspect and/or replace springs and hardware
  - 1.2.6 reassemble brakes
  - 1.2.7 install the drums
- 1.3 explain the construction, design features and operation of drum-type parking brake systems
- 1.4 service, adjust and repair drum-type parking brake systems

### **2. service and repair disc brake systems**

- 2.1 explain the construction, operation and design features of disc brake systems including:
  - 2.1.1 advantages
  - 2.1.2 design
  - 2.1.3 operation
  - 2.1.4 components
- 2.2 service and repair disc brake systems
  - 2.2.1 inspect all components
  - 2.2.2 remove callipers and pads
  - 2.2.3 inspect and repair callipers and pads
  - 2.2.4 inspect and repair disc
- 2.3 explain the construction and operation of disc-type parking brake systems including:
  - 2.3.1 drum-in-hat
  - 2.3.2 integral



- 2.4 service, adjust and repair disc-type parking brake systems including:
  - 2.4.1 drum-in-hat
  - 2.4.2 mechanical calliper
- 3. demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks
- 4. create a transitional strategy to accommodate personal changes and build personal values**
  - 4.1 identify short-term and long-term goals
  - 4.2 identify steps to achieve goals

## **COURSE ASA3445: BRAKING SYSTEMS III**

**Level:** First Period Apprenticeship, Group C

**Prerequisites:** ASA3400: Basic Tools & Materials  
ASA3410: Electrical Circuits & Diagnosis  
ASA3435: Braking Systems I  
ASA3440: Braking Systems II

**ILM Resources:** Power Brakes 090105e, Brake System Diagnosis and Service 090105f, Antilock Brake Systems 090105g

**Description:** Students develop the necessary knowledge, skills and attitudes to identify, diagnose, service and maintain power brake and anti-lock braking system (ABS) components, as well as perform routine maintenance to the brake system according to accepted trade practices.

**Parameters:** Access to a materials work centre, complete with specialized brake tools and related resources, and to instruction from an individual with journey person certification as an automotive service technician.

**Outcomes:** The student will:

### **1. diagnose and service power brakes**

- 1.1 describe the operation of vacuum-operated power brake units including:
  - 1.1.1 vacuum brake booster operation
- 1.2 describe the operation of hydraulically operated power brake units including:
  - 1.2.1 hydraulic brake booster operation
- 1.3 demonstrate a procedure for testing a power brake unit including:
  - 1.3.1 testing vacuum-assist power brake units
  - 1.3.2 testing hydraulic-assist power brake units
- 1.4 diagnose problems related to a power brake including:
  - 1.4.1 troubleshooting vacuum-assist power brake units
  - 1.4.2 troubleshooting hydraulic-assist power brake units

### **2. service, repair and diagnose problems related to brake systems**

- 2.1 demonstrate brake flushing and bleeding procedures on brake systems including:
  - 2.1.1 fluid service
  - 2.1.2 service methods
- 2.2 diagnose problems related to brake systems

### **3. diagnose and service ABS**

- 3.1 identify basic ABS fundamentals and components
- 3.2 explain the operation of an ABS system including:
  - 3.2.1 system self-test
  - 3.2.2 normal stop
  - 3.2.3 stops requiring ABS action
  - 3.2.4 traction control operation
- 3.3 demonstrate brake bleeding and flushing procedures of an ABS system
- 3.4 demonstrate a diagnostic procedure for an ABS system including:
  - 3.4.1 diagnostic pre-checks

**4. demonstrate basic competencies**

4.1 demonstrate fundamental skills to:

- 4.1.1 communicate
- 4.1.2 manage information
- 4.1.3 use numbers
- 4.1.4 think and solve problems

4.2 demonstrate personal management skills to:

- 4.2.1 demonstrate positive attitudes and behaviours
- 4.2.2 be responsible
- 4.2.3 be adaptable
- 4.2.4 learn continuously
- 4.2.5 work safely

4.3 demonstrate teamwork skills to:

- 4.3.1 work with others
- 4.3.2 participate in projects and tasks

**5. create a transitional strategy to accommodate personal changes and build personal values**

5.1 identify short-term and long-term goals

5.2 identify steps to achieve goals

## **COURSE ASA3450: DRIVELINES & INTRODUCTORY WELDING**

**Level:** First Period Apprenticeship, Group A

**Prerequisite:** ASA3400: Basic Tools & Materials

**Description:** Students develop the necessary knowledge, skills and attitudes to identify the purpose, describe the operation and perform the servicing of a vehicle driveline. Students develop the necessary knowledge, skills, and attitudes to heat, cut (using oxyacetylene) and weld (using Gas Metal Arc Welding [GMAW]).

**Parameters:** Access to a materials work centre, complete with access to driveline units, hand tools, specialized driveline tools, oxyacetylene, GMAW equipment and related resources, and to instruction from an individual with journeyperson certification.

**ILM Resources:** Drivelines 090103a, Oxyacetylene Heating and Cutting 090102a, Gas Metal Arc Welding (GMAW) (MIG Welding) 090102b

**Outcomes:** The student will:

- 1. diagnose, service and repair drivelines, universal joints and constant velocity joints**
  - 1.1 explain the construction, design features, operation and function of common driveline components
  - 1.2 service and repair driveshaft assemblies
  - 1.3 service and repair common types of universal and constant velocity joints including:
    - 1.3.1 cross and roller universal joint service
  - 1.4 diagnose and repair driveline vibration problems
- 2. perform metal heating and cutting operations safely, using oxyacetylene equipment**
  - 2.1 demonstrate the use of personal protective equipment to ensure welding safety
  - 2.2 describe the characteristics and handling procedures for oxygen and acetylene (C<sub>2</sub>H<sub>2</sub>) including:
    - 2.2.1 handling cylinders
  - 2.3 demonstrate handling procedures for:
    - 2.3.1 regulators
    - 2.3.2 hoses
    - 2.3.3 check valves
  - 2.4 demonstrate the use, care and maintenance of torches and tips including:
    - 2.4.1 set-up prior to use
    - 2.4.2 heating and welding tips
    - 2.4.3 cutting attachment
  - 2.5 perform basic cutting operations including:
    - 2.5.1 cutting preparation
    - 2.5.2 the cut
- 3. perform nonstructural welding, using GMAW equipment**
  - 3.1 describe the principles of operation of GMAW including:
    - 3.1.1 metal transfer
    - 3.1.2 short-circuiting metal transfer
    - 3.1.3 globular transfer
    - 3.1.4 spray transfer

- 3.2 identify the components of a basic GMAW set-up including:
  - 3.2.1 equipment for GMAW
  - 3.2.2 power sources
  - 3.2.3 wire feeder
  - 3.2.4 electrode holders and cable assembly
  - 3.2.5 spooled filler wire
  - 3.2.6 shielding gas
  - 3.2.7 regulators/flowmeters
- 3.3 diagnose and demonstrate corrective measures for malfunctioning GMAW equipment including:
  - 3.3.1 corrective measures with welding techniques
  - 3.3.2 corrective measures with wire feed equipment
  - 3.3.3 troubleshooting wire feed equipment
  - 3.3.4 weld defects
- 3.4 identify the precautions against electrical shock, toxic fumes and radiant energy associated with GMAW including:
  - 3.4.1 safety
  - 3.4.2 electrical hazards
  - 3.4.3 toxic fumes
  - 3.4.4 personal protection
- 4. demonstrate basic competencies**
  - 4.1 demonstrate fundamental skills to:
    - 4.1.1 communicate
    - 4.1.2 manage information
    - 4.1.3 use numbers
    - 4.1.4 think and solve problems
  - 4.2 demonstrate personal management skills to:
    - 4.2.1 demonstrate positive attitudes and behaviours
    - 4.2.2 be responsible
    - 4.2.3 be adaptable
    - 4.2.4 learn continuously
    - 4.2.5 work safely
  - 4.3 demonstrate teamwork skills to:
    - 4.3.1 work with others
    - 4.3.2 participate in projects and tasks
- 5. create a transitional strategy to accommodate personal changes and build personal values**
  - 5.1 identify short-term and long-term goals
  - 5.2 identify steps to achieve goals



**COURSE ASA3455: ASA PRACTICUM COURSE A**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns

- 2.5 evaluate a professional in a related occupation in terms of:
  - 2.5.1 training and certification
  - 2.5.2 interpersonal skills
  - 2.5.3 technical skills
  - 2.5.4 professional ethics

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**COURSE ASA3460: ASA PRACTICUM COURSE B**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns

- 2.5 evaluate a professional in a related occupation in terms of:
  - 2.5.1 training and certification
  - 2.5.2 interpersonal skills
  - 2.5.3 technical skills
  - 2.5.4 professional ethics
- 3. **demonstrate basic competencies**
  - 3.1 demonstrate fundamental skills to:
    - 3.1.1 communicate
    - 3.1.2 manage information
    - 3.1.3 use numbers
    - 3.1.4 think and solve problems
  - 3.2 demonstrate personal management skills to:
    - 3.2.1 demonstrate positive attitudes and behaviours
    - 3.2.2 be responsible
    - 3.2.3 be adaptable
    - 3.2.4 learn continuously
    - 3.2.5 work safely
  - 3.3 demonstrate teamwork skills to:
    - 3.3.1 work with others
    - 3.3.2 participate in projects and tasks

**COURSE ASA3465: ASA PRACTICUM COURSE C**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns



- 2.5 evaluate a professional in a related occupation in terms of:
  - 2.5.1 training and certification
  - 2.5.2 interpersonal skills
  - 2.5.3 technical skills
  - 2.5.4 professional ethics

**3. demonstrate basic competencies**

- 3.1 demonstrate fundamental skills to:
  - 3.1.1 communicate
  - 3.1.2 manage information
  - 3.1.3 use numbers
  - 3.1.4 think and solve problems
- 3.2 demonstrate personal management skills to:
  - 3.2.1 demonstrate positive attitudes and behaviours
  - 3.2.2 be responsible
  - 3.2.3 be adaptable
  - 3.2.4 learn continuously
  - 3.2.5 work safely
- 3.3 demonstrate teamwork skills to:
  - 3.3.1 work with others
  - 3.3.2 participate in projects and tasks

**COURSE ASA3470: ASA PRACTICUM COURSE D**

**Level:** Advanced

**Prerequisite:** None

**Description:** Students, on the work site, continue to develop and refine those competencies developed in related Career and Technology Studies (CTS) occupational areas, previous practicums and other experiences.

**Parameters:** This course should be accessed only by students continuing to work toward attaining a recognized credential offered by an agency external to the school. Practicum courses extend the competencies developed in related CTS occupational areas. The practicum courses may not be delivered as stand-alone courses and may not be combined with core courses. This course may not be used in conjunction with Registered Apprenticeship Program courses. This practicum course may be delivered on- or off-campus. Instruction must be delivered by a qualified teacher or an experienced professional, who is under the supervision of the qualified teacher; both must be authorized to supervise trainees for the external credential.

**Outcomes:** The student will:

- 1. perform assigned tasks and responsibilities efficiently and effectively, as required by the agency granting credentials**
  - 1.1 identify regulations and regulatory bodies related to the credential
  - 1.2 describe personal roles and responsibilities including:
    - 1.2.1 key responsibilities
    - 1.2.2 support functions/responsibilities
    - 1.2.3 code of ethics
  - 1.3 describe personal work responsibilities and categorize them as:
    - 1.3.1 routine tasks; e.g., daily, weekly, monthly, yearly
    - 1.3.2 non-routine tasks; e.g., emergencies
    - 1.3.3 tasks requiring personal judgement
    - 1.3.4 tasks requiring approval of a supervisor
- 2. analyze personal performance in relation to established standards**
  - 2.1 evaluate his or her application of competencies developed in related CTS courses
  - 2.2 evaluate standards of performance in terms of:
    - 2.2.1 quality of work
    - 2.2.2 quantity of work
  - 2.3 evaluate his or her adherence to workplace policies and procedures related to health and safety
  - 2.4 evaluate the work environment in terms of:
    - 2.4.1 location
    - 2.4.2 floor plan of work area
    - 2.4.3 analysis of work flow patterns

2.5 evaluate a professional in a related occupation in terms of:

- 2.5.1 training and certification
- 2.5.2 interpersonal skills
- 2.5.3 technical skills
- 2.5.4 professional ethics

**3. demonstrate basic competencies**

3.1 demonstrate fundamental skills to:

- 3.1.1 communicate
- 3.1.2 manage information
- 3.1.3 use numbers
- 3.1.4 think and solve problems

3.2 demonstrate personal management skills to:

- 3.2.1 demonstrate positive attitudes and behaviours
- 3.2.2 be responsible
- 3.2.3 be adaptable
- 3.2.4 learn continuously
- 3.2.5 work safely

3.3 demonstrate teamwork skills to:

- 3.3.1 work with others
- 3.3.2 participate in projects and tasks











